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VOL. XI JULY 25, 1922 No. 8

Scientific Management for Rubber Manufacturers

Location and Layout

This, the Second Article of the Series, Which Began in the June 10th Issue, Deals with Two Important Considerations

By Alfred Baruch

Consulting Industrial Engineer, New York

IN choosing the site for the location of a rubber factory, the manufacturer must be guided by the same principles that govern production in general—namely; nearness to the source of raw material, proximity to market, ample transportation facilities, good labor supply, cheap taxation, and power.

The chief materials used in rubber manufacture are cotton fabric and rubber. Practically all the rubber used is imported. The cotton fabric is manufactured in the New England States and in New Jersey. Since rubber has to be imported this would seem to indicate that the natural location for a rubber manufacturing plant is somewhere in the East, preferably New England, New York, or New Jersey.

However, the chief market for the most important rubber products, tires and tubes, is Detroit and the surrounding towns that go to make up the automobile center of the United States. The rest of the market is scattered all over the country and varies in proportion to the density of population.

Consequently, the choice of a location for a rubber factory will depend largely on the owner's personal judgment as to the potentialities of the region in which he decides to settle. Akron, Ohio, is the recognized center of the rubber industry in the United States and for that matter in the world. But Akron is badly over-crowded and is subject to a very unstable supply of labor. The bulk of the labor supply comes from the neighboring regions of Ohio, Indiana, and West Virginia. These same people often supply the farm labor in the summer, and the problem of filling their places becomes very serious. A natural consequence of this situation is that rubber factories pay more for unskilled and semi-skilled labor than most of the other industries.

Branch Factories are a Solution

The most practical solution of this problem seems to be the opening of branch factories in the different sections of the world to supply the local demand. Thus, if the manufacturer has his main factory in New York and he wished to compete for the Chicago trade, the natural way for him to do this would be to open a branch somewhere in Illinois or Northern Ohio.

It is natural for a rubber manufacturer to start in a small way, although the almost unbelieveable success of the tire industry is quite likely now to induce the investment of big capital in this field. The man starting in a small way is usually not in a position to erect a new building along scientific lines but is compelled to rent or buy one already erected. This means that he will have to take the best one available as the other considerations of nearness to market, good labor supply, low taxation rates, ample transportation facilities, and cheap power will be paramount in influencing his choice. Consequently, he has to resort to the ordinary precautions—the building must be strongly built since it will have to stand the strain of heavy machinery; it must have good lighting facilities, plenty of window and skylight area, and must take full account of the physical needs of the men to be housed in it.

Selection of Equipment is Important

Naturally, the greatest possibilities for laying the foundation of high production efficiency lie in the care with which the equipment is selected and in its careful arrangement on installation. In order to do this intelligently it is necessary to consider the fundamental characteristics of rubber factories as compared with other industries. They have been classified as continuous process and intermittent types. The continuous process industry takes the material in its raw form and passes it through successive operations until it comes out in a finished state. The manufacturing problem here is comparatively simple since it is easy to arrange the equipment in such a way that there will be no retracing of steps and consequently no duplications or loss in motion. In the intermittent type of industry, the various components of the finished product are produced separately and come together on the assembly floor to form a finished whole. Here too, the manufacturing problem is very simple since all that is required is that the various machines used in production are properly balanced.

Unfortunately, most industries combine the intermittent with the continuous processes and it is this combination which is the most fruitful source of trouble in modern management. In the preparation departments of a rubber factory the process is continuous; in the manufacturing departments, the process is intermittent. There are some variations even to this arrangement as, for example, the manufacture of solid tires where the continuous process alone is employed.

Naturally, the type of the industry influences the arrangement of the equipment as continuous process manufacturing leaves no room for doubt as to the arrangement of the machinery. The sequence of operations determines the ar-

rangement entirely since it must be obvious to everyone that where the manufacturing steps are successive any doubling back or retracing is not only superfluous but also expensive and inefficient.

In the intermittent industry it is possible to arrange the equipment in a different manner so as to permit machines that do the same work to be grouped in the same department. This is known as the functional type of arrangement and the other is referred to as the product type.

The Functional Arrangement of Equipment

In rubber manufacturing the arrangement of equipment by functions rather than by product is possible only in the preparation department since it is their duty to produce the material necessary for various rubber products in the elementary stages. That is, all rubber must be compounded, milled, and nearly all calendered before it is ready for use or for manufacture into special products such as tires, tubes, hose, etc. Because of this fact it is possible to do all the compounding, the milling, and the calendering in one place. The question now remains as to whether this is advisable.

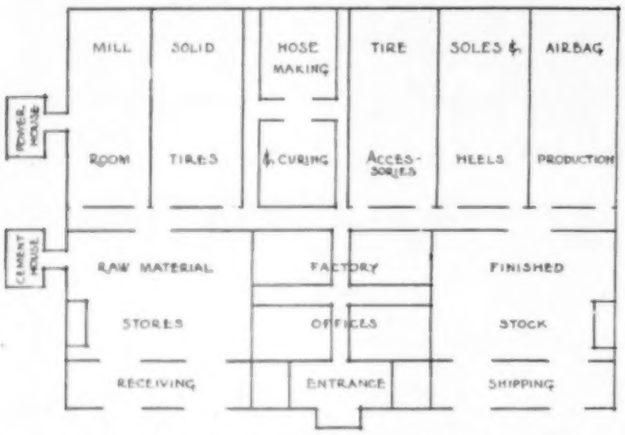


FIG 1 LAYOUT MISCELLANEOUS RUBBER DEPARTMENTS

In all products that require calendering in any of their components the calender process is the pivotal point in their production. The calender is the biggest single machine used in rubber manufacturing that requires special rigging for a particular product and even for a particular size of product. Consequently, the production that precedes it and the production that comes after it must depend to a large extent on the rate at which the product passes through the calender process.

For this reason, it seems that the most logical way in which to arrange the machinery is by product as soon as special rigging is required which restricts the use of a machine to one product. For example, the calenders required to produce the various kinds of tire stock should be made a part of the continuous chain of equipment to produce the tires. The calenders required to produce tube stock should be placed with the tube equipment.

This will have the effect of turning rubber manufacture into a continuous process for all practical purposes. It would make possible the arrangement of machinery so that the progress of production is all in one direction. That is, the raw material starts at one end and comes out in completed form at the other. This is the ideal toward which all rubber manufacturers should work since it will make possible the maximum use of the equipment and yield the best quality of production.

This naturally gives rise to the question as to what a man must do if his production is so small that he can only use one or two calenders. The best thing to do is to specialize entirely in the production of one or two rubber commodities since his chances of surviving competition are much better if he does. The customary arguments against specialization in one product alone are pretty well known. In the first place the man seems to be putting all his eggs in one basket; secondly, he is making no provision for the disposition of his by-products.

Specialization in Production Desirable

Each case must be treated on its own merits. In the rubber industry, specialization in production is highly desirable since the whole field is already specialized and there is a regularly established demand for tires, tubes, hose, beltings, rubber soles and heels, etc. When the demand for tires or tubes drops, the demand for all rubber commodities drop since tires and tubes cater both to the necessities and the pleasures of the public, and the market for tires may very well be taken as an index to general conditions. Furthermore, it is easy to change the set-up of a calender when the occasion requires switching from one product to another. The truth of the matter is unless the small manufacturer specializes in one product and devotes his entire energy to making that product on the most efficient basis possible he has very little chance in open competition with the large manufacturers who are in a position to make great economies by this very specialization.

As has been stated before, if a rubber manufacturer is going to specialize his product, it stands to reason that he must specialize his machines—that is, those machines which may be used for more than one type of product. This will follow as the natural consequence of his concentrating on one or two products but the purpose of specializing machines is that the machine to be used for one product must be grouped with the other machines that are essential to the process of manufacturing that product. For example, if calender machines are to be used for making tire fabrics, then the calenders must be placed in such a way that the preparation and production of tires is one continuous process and requires no doubling back. Consequently, it is advisable in laying out the factory to group the machines according to product rather than according to function.

The Layout of a Plant

The following layout of a rubber factory is furnished with this in mind. It is assumed that this factory produces rubber tires, tubes, and then a group of miscellaneous products such as automobile tire accessories, rubber hose, solid tires, soles and heels, and mechanical rubber products in general. A three-story building with ample facilities for shipping and receiving the material will ordinarily meet the requirements of the small or medium-sized rubber shop.

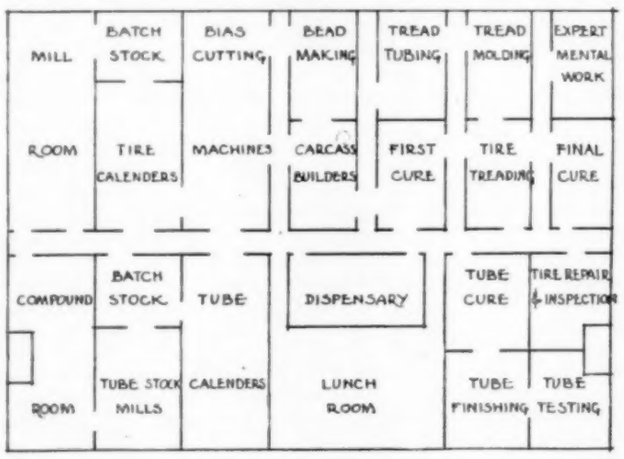


FIG 2 LAYOUT OF THE TIRE AND TUBE DEPARTMENTS

The first floor should be divided between the offices, receiving, and shipping departments, the storage of raw material both rubber and cotton fabrics, and the manufacture of all products other than tires and tubes. The departments would appear in the following order starting from the left and going to the right:

(a) Mill room for mechanical rubber and lampblack compounds.

(b) Receiving room for all incoming materials and supplies.
(c) General storage for raw materials and supplies.
(d) Solid tires department, composed of the tubing machines, the solid tire molds and heaters, and the various wheels for putting on the rims and the under cover.
(e) Hose tubing department.
(f) Hose fabric-cover braiding machines.
(g) Hose cure.
(h) Tire and tube accessories' layout tables.
(i) Accessories' vulcanizers.
(j) Air-bag layout table.
(k) Air-bag vulcanizers.
(l) Shipping department.

Whenever the cement bath is used in the preparation of the warp fabric, the cement house should be located outside of the main building at a sufficient distance to prevent the spread of a fire in case it starts in the cement house. However, some firms have been able to prepare the friction in such a way that warp fabrics need not be cemented. This would do away with the cement house which is always a troublesome problem.

In most of the old buildings that generate their own power the power house is also apart from the main building and the power is transmitted to the various machines by direct shafting but it has been found economical in recent years to install a motor in each department and even with each machine that requires power so as to avoid the loss that usually comes with long transmission. In case the power is bought instead of generated at the factory, this would certainly be the most advisable method, since it would make possible an accurate distribution of the power cost of each department.

Arrangement of the Second Floor

The second floor should be devoted to the manufacture of tires and tubes. Experience shows that one calender provides work for a definite number of mills. Consequently, there would be no object in concentrating all of the mills in the factory in one place since some of the mills would be used all of the time to feed certain calenders while others would be devoted entirely to another group. The mills that grind the tire stock are put in the tire section, apart from all other mills in order to provide a continuous process of the material through the factory from raw to finished stock. One compound room usually serves the entire factory. The tire production department then should be laid out in the following order:

(a) Mill room.
(b) Batched Stock.
(c) Calenders.
(d) Bias cutting.
(e) Bead department.
(f) Tire building.
(g) Tubing treads.
(h) First cure of tires.
(i) Molding and curing tire treads.
(j) Cementing the treads to the tires.
(k) Second cure of tires.
(l) Experimental and testing department.
(m) Tire repairs department.

The other half of this floor can be devoted to the manufacture of tubes. The compound room is located in this section because all of the rubber has to pass through the same compounding process and there is nothing to be gained by separating the compound department into the various sections. Besides, the compounding is kept secret in most tire factories and it is not convenient to have a secret process spread all over the factory.

This section should be laid out in the following manner:

(a) Compound room.
(b) Mill stock room.
(c) Mills.
(d) Back stock store room.
(e) Calenders.
(f) Tube building department.
(g) Lunchrooms and dispensary.
(h) Tube finishing department.
(i) Tube vulcanizing.
(j) Tube repair department.

The Storage Space Factor

In laying out the factory, ample provision must be made for the storage of raw material, work in process, and finished stock. However, it is very important not to allow too much storage space since that fact will have a very important effect most upon the efficiency of production and upon the amount of capital tied up in material at the various stages of production. It is absolutely essential to have a store room for raw materials—rubber, cotton fabric, and supplies. This store room should be just large enough to keep the factory going at maximum speed in normal times. In past years of abnormal production, factory managers fell into the error of carrying too large a supply of material on hand because of the unusual demand. It is natural enough to stock up when the market is rising and when the demand is large so as to prevent any hold-up in production. However, the rubber manufacturer is not a broker in raw materials and should never consider himself in that light. It is good manufacturing policy to take advantage of market conditions whenever possible, but the man who tries to make his profits by the rise or fall in the market of raw material had better get out of the manufacturing field altogether. When production is abnormally high and the supply of material on hand is necessarily high, the manufacturer must make shift in some way or another to meet the demand temporarily. But it would be a serious mistake on his part to provide enough storage space at all times to meet the abnormal demand which may come once in eight or ten years. From the very beginning, his policy in manufacturing must be predicated upon normal production.

By arranging the factory along the lines of continuous process it is possible to schedule production to the plant with little or no storage in between departments. This is done by providing the preparation departments with slightly more equipment than the departments they supply. For example, the first cure of tires would have a little more capacity than the final cure. Similarly, the tire building and the tube treading department would have more capacity than the first cure, and so on down the line. This compels each department to work at its maximum speed and provides against unforseen delays and breakdowns.

However, there are some departments which must have a supply of stock ahead in order to operate efficiently. Because of the fact that all compounding is done in one place and because it is only possible to work on a limited number of compounds at one time, it is necessary to have a store room immediately after the compound in order to provide the mechanical rubber department with material while the tire and tube department rubbers are being compounded. For the same reason because of a variety in production, it is necessary to have a store room immediately after the grinding or milling of the rubber, so that one section will not be held up while the other is being supplied with material.

In tube production no other store rooms are necessary until the tubes are finished except where drying is a part of the operation and the tubes have to remain in one spot to be dried before they can be used in the next operation.

Stores of Batched Stock Necessary

In the mechanical rubbers, solid tires, and accessories it will be found necessary to provide a store of batched stock immediately after the mills and since each of these departments have individual equipment it will be necessary to provide storage space for the finished stock in each case according to the volume of production. But it is not advisable to carry a finished stock of large proportions either in the tire, tube, or any other rubber product.

Transportation facilities and wide runways must be provided so as to make the transfer of material from one place to another very easy, In the case of mill stock and batched stock, it has been found economical to keep the stock on skids so that tractors may haul them from one place to another without double handling of the material. This method has several advantages, the chief among them being that the stock is not permitted to age if managed properly when kept on skids. But if put in storage racks or bins, it not only has to be handled twice but there is always the danger of the oldest

(Continued on page 279)

ABSTRACTS

Technical — General — Commercial

Treatment of Raw Rubber

In the treatment of raw rubber, the freshly coagulated rubber is subjected to massaging or kneading between rollers to form a solid roll, but this process has been found not to remove all the water contained in the rubber. In the present process, which is patented in England by the Sirocco Engineering Works—see British Patent No. 179,622—the rolled mass of rubber, while it is still under pressure, is enveloped in a tight wrapping of absorbent material such as cotton webbing. The effect of this webbing is to absorb the residue of the moisture which is contained in the rubber mass and hence to allow it to evaporate. The subsequent drying of the cotton webbing surrounding the mass of rubber causes a further contraction and compression of the rubber. The wrapping is formed in such a manner that it can be placed in position before the rubber is removed from the rollers. The treatment which the rubber mass receives in this process is very effective in expelling the moisture contained in it, as it has been found that after the rubber has been treated in this manner, it may be subjected to a pressure of five tons per square inch without expelling any more moisture.

Process of Vulcanizing Rubber

The process of vulcanizing rubber, which is described in French Patent No. 520,477 and which is assigned to the well-known Italian rubber chemist G. Bruni, is concerned with an improvement in the use of accelerators to hasten the vulcanization process. The metallic salts of the acids, N-alcoyl-dialcoyl and alcolydene-dithiocarbamic, are used for this purpose, as they possess the property of accelerating the vulcanization of rubber. This makes it possible to decrease the proportion of non-combined sulphur in the rubber used for industrial and commercial purposes to a minimum or even to eliminate it entirely. The advantages of this are that in the first place the trouble efflorescence of sulphur in vulcanized rubber is avoided, and on the other hand super-vulcanization which may be brought about by prolonged heating, is also avoided. Among the metallic salts which are used for this purpose, there may be mentioned those of magnesium, zinc, cadmium, mercury, aluminum and iron, or even such radicles as the uranyl. For example, the salt that is obtained from piperidine, namely, pentamethylene-dithiocarbamate of zinc, may be used for this purpose.

Vulcanization Accelerator

Furfuramide, which is made by the action of ammonia on fufurol, is used as an accelerator of the vulcanization of rubber according to French Patent No. 523,417, which is assigned to the Societe Ricard, Allenet et Cie. The furfuramide is incorporated with the rubber compound in the proportion of half to two per cent by weight. When this is done, the time of vulcanization is lowered by 70 to 85 per cent and the temperature of the vulcanized product is decreased by 8 to 10 degrees C. At the same time the quality of the rubber is enhanced considerably. Its strength and elasticity are increased from 100 to 150 per cent.

Rubber Kneading Machines

In French Patent No. 520,337 there is described a machine for kneading rubber, in which the novel feature is the discharge of the rubber mass therefrom. The rubbery mass—the machine may be used as well for mixing artificial rubber masses—is caused to emerge from the mixing chamber through suitable exit openings, so that it runs out in the form of sheets or slabs.

Repairing Rubber Articles

British Patent No. 178,205 is concerned with a process and apparatus of repairing rubber articles by molding. This refers particularly to rubber tires. The alloy out of which the mold is made has a melting point above that of the vulcanization temperature, but below that temperature at which the rubber is affected injuriously by the heat. A range of temperature between 280 degrees F, which is the maximum temperature required for vulcanization, and 320 degrees F, which is the highest rubber will withstand without being injured, is most suitable for this purpose. An alloy containing one part of tin and one part of bismuth will melt at 286 degrees F, and another containing three parts of lead, three parts of tin and one part of bismuth will melt at 320 degrees F. These alloys are satisfactory.

The process is carried out in this manner. The alloy is melted and then cast on the uninjured part of the tire or on another tire of the same shape, so that a mold of the desired form can be obtained. The temperature at which the alloy is maintained in the liquid condition is too low to harm the rubber in any way. When the metal has solidified, the mold is removed and applied to the injured part of the tire and the repair is made in the usual manner by vulcanization. The process is very easy to carry out and can be applied to rubber articles of any shape or form.

Preserving Rubber Latex

Recently the rubber industry was advised of an important development in an entirely new direction, namely, the application of the rubber latex to the paper pulp in the beater so as to make a rubberized paper of very special and extraordinary qualities. For this purpose rubber latex, in the uncoagulated state, had to be transported from the rubber plantations to England. If the industry develops and spreads to this country as well, there will be a great need for a preservative which can be mixed with the rubber latex so that it may reach its far destination in good condition, available for use in making rubberized paper etc. The preservative must not have any bad effects on the latex.

Such a preservative is patented in British Patent No. 178,337. The preservative is of the alkalized phenol type and is made in solid cakes so that it can be transported easily. The mixture is prepared by adding two parts by weight of phenol crystals to one part by weight of caustic soda. The mixture is heated; it becomes liquid, but then changes into a fine white powder. This powder can be compressed into cakes, which will remain in their original condition as long as they are not exposed freely to atmospheric action.

Galalith in Rubber Making

Galalith is an artificial product, made with a caseine base, and used in place of natural ivory. For example, the keys of pianos are manufactured from this material. In the course of this manufacture, there is a considerable amount of dust and waste galalith collected which can be used to good advantage in the compounding of rubber. The dust is all of one color and makes a very good filler. It is found that rubber compounded with this material is quite satisfactory.

When galalith is subjected to the action of ammonia gas, it is changed into a gelatinous product. The formaldehyde, which it contains and which was used in its manufacture, is converted into hexamethylene tetramine and the caseine is changed into the soluble form. The mixture that is obtained in this way is an accelerator of the vulcanization of rubber, due to the fact that the ingredients in this mixture form a certain amount of thio-urea at the temperature of vulcanization. It can be used to good advantage for this purpose. For further details see Kunstoffe, 1922.

Measuring the Size of Pigments Used in Rubber Manufacture

By A. D. Luttringer, *Le Caoutchouc et la Gutta Percha*, 1922, pages 11308 to 11313. Translated for THE RUBBER AGE

By Ismar Ginsberg, B.S., Ch,E:

IT is well known that the fineness of the fillers and coloring matters used in compounding rubber plays a very important part in determining the mechanical properties of the finished product. The exceptionable properties of carbon black in the rubber mixture are claimed to be due wholly to the extreme fineness of the substance. In fact, the relationship between the resilience of the rubber mixture and the fineness of the pigment appears to be so close and exact—there are but a few exceptions to this rule—that it has been proposed to measure the size of the particles of an unknown pigment by determining with the aid of a plantimeter, the area under a curve which is established under fixed conditions, the pigment being used in standard mixtures, and by comparing the work of deformation with that of an unknown pigment.

Resistance to Abrasion not Wholly Dependent on Particle Size

In passing it might be mentioned that the resistance of the rubber composition to abrasion as well as other properties of pigments, which are of importance mainly in paint and varnish manufacture, are not only dependent on the fineness of the same. There are other characteristics of the pigment, such as surface tension, density, force of adherence, etc which are also of significance. These are the properties, especially the first and last named, which perhaps account for the fact that zinc oxide does not follow the general rule.

However, the determination of the fineness of the pigment is of singular importance to the rubber maker. In the first place it is evident that only the average dimensions of the pigment can be determined. The problem is a very difficult one. The pigments that are bought on the market for rubber compounding purposes, even when they are very homogeneous in appearance, nevertheless vary greatly in the diameter of the individual particles. The diameter of the relatively large particles is frequently a great multiple of that of the finest particles. In order to secure a maximum degree of accuracy in the measurements, it is necessary to measure thousands of individual particles. The real fineness of the pigment can then be found by drawing a series of curves. This procedure requires the use of a miscroscope and becomes a most tedious and exacting work. The method is accordingly of no practical importance. Consequently recourse is had to mathematical simplifications.

The Mathematical Principle of the Methods

It is assumed that all the particles in the pigment possess spherical forms. S is called the specific surface of a pigment, expressed in square meters per gram of substance. This specific surface is inversely proportional to the diameter of the individual particles, and is accordingly a very important factor in determining the properties and quality of the pigment. D is the density of the substance and d the diameter of the individual particle in microns. The following equation then correlates these quantities:— $\Delta \, S \, d = 6$, or $S = \frac{6}{\Delta \, d}$.

The curves for oxide of zinc (density 5.78) and lead carbonate (density 6.81) have been determined. A study of these curves reveals the fact that when the pigments are relatively coarse-grained, in the case of a diameter above 0.8 micron, a difference of 0.1 or 0.2 micron has only a slight influence on the magnitude of the specific surface factor. On the contrary below 0.8 micron, the contrary is true. In the case of very fine pigments such as oxide of zinc, it is possible to find materials on the market of difference grades, corresponding to diameters of 0.3 and 0.6 micron. While the difference in the diameter is only 0.3 micron, the difference in the specific surface, on the other hand, is found to be as much as 100 per cent. It is accordingly evident that it is not splitting hairs to differentiate between such fine diameters.

The Dinwiddie Method

This method is not very accurate but it is quite novel. The finger is dipped in the pigment and then rubbed over the grooves of a phonograph disc. The surface is then examined under the microscope. The disc has a groove which runs in a spiral at 150 revolutions per inch radius. In other words, the lines are separated by a distance of one one hundred and fiftieth of an inch from center to center. The radius of curvature of the disc is four one thousandths of an inch. The average depth of the groove is one one thousandths of an inch.

One disc can be used for several different pigments. Certain fundamental differences between pigments are noticed when they are rubbed on the disc. Some pigments have a rough touch and appear to be mixed with gravel. Others on the contrary have a soapy or unctuous feeling. In this manner, for example, the difference between two samples of kaolin or sulphate of barium can be detected by rubbing them with the finger on a phonograph disc, although when rubbed between the fingers, they appear to be the same. One of these pigments may have a soft touch while the other a granular touch.

Particle Dimensions Differ

Examination under the miscroscope shows that pigments are composed of particles of different dimensions. The large particles are often covered with a coating of fine particles. When the pigment is rubbed over a phonograph disc, the coarse crystals are forced to penetrate into the grooves and their facets parallel are oriented to the plane of the disc. The fine particles are detached from the coarser and consequently the real form of the latter is disclosed. The relative degree of coloration, the whiteness and the covering power of the pigment, all properties which are significant in determining the efficiency of the material in its application is compounding rubber, are also indicated to some degree by this test.

Photomicrographs may be made of the pigment smeared on the phongraphic disc, by taking care to use a very bright source of light and interposing a layer of water to absorb the heat from the light rays. Otherwise, the high temperature of the light rays will fuse the ridges of the disc. The number of particles in a given weight of pigment can be counted with the aid of the hematimeter, the instrument used in counting blood corpuscles in the blood. A very small amount of the pigment is used for this purpose and is suspended in a solution of gelatine. The details of the method need not be described here.

Photomicrographical Method

This method was developed by Henry Green; it is much more accurate than the disc method, although the principle on which it is based is not new. The pigment is prepared in the usual manner for taking a photomichograph of known magnification, so as to reveal clearly and distinctly each and every particle, the dimensions of which are then measured by a special method.

About one milligram of the pigment is placed on a microscope slide and a drop of redistilled turpentine is added. The pigment is distributed through the turpentine in an extremely fine film by the aid of a glass rod. After the dis-

persion of the pigment is complete, the turpentine is evaporated entirely by placing the slide on a hot plate for 40 to 50 seconds. The particles of pigment remain adherent to the glass. After cooling sufficiently a drop of glycerine is placed on the slide and another slide is placed on top and the excess glycerine is squeezed out.

Three conditions must be fulfilled in this microscopic examination. The particles must all lie in the same plane; they must be free from the Brownian movement, that is they must not be in the colloidal condition; the particles must be distributed in individual grains, without aggregations or flakes.

The magnification is 1500 diameters in the case of such pigments as oxide of zinc, lithopone, oxide of iron, white lead etc. Coarser grained pigments need not be magnified so highly. The method of measuring the dimensions of the particles must be one that is rapid and not tiring, as it is necessary to measure thousands of them. The photomicrographic negative is projected on a screen, so that the total magnification of the original particles amounts to 20,000 to 25,000 diameters. The size of the individual particles is determined by means of a millimeter scale. To eliminate the possibility of error the surface of the screen is divided up into little squares. Fractions of a millimeter are rejected. About two seconds are required for each measurement. The average of all the readings is found quickly with the aid of an adding machine.

By marking each particle and arranging the readings in tabular form, it is possible to attain figures for the average size of the particles as well as for the coefficient of uniformity. In one case the average size of the particles of an oxide of zinc pigment was found to be 0.522 microns, which is slightly more than half a thousandth of a millimeter in diameter. The coefficient of uniformity was found to be about 30 per cent, that is 30 per cent of the sample of the pigment was made up of particles of the same size. The frequency of the occurrence of particles of various sizes is very important in determining the real texture of the pigment. It is understood in speaking of the dimensions of the particles that they are assumed to be spherical in shape, and consequently only the diameter need be measured. It is of course possible to have particles which are parallelopipeds in shape, and in that case, to be very exact, all three dimensions would have to be ascertained and the mean of all determined.

Three Degrees of Fineness

The study of the fineness of pigments reveals the fact that they may be divided into three degrees of fineness: first the colloidal particles, then the sublimed and precipitated products, such as oxide of zinc lithopone, the type of pigments used in rubber manufacture, and finally clays and ground materials, such as sulphate of barium, asbestine, etc which are used rather as rubber fillers than as coloring matters.

Vogt Method

This method is based on the determination of the hiding power of the pigments. The use of relatively stable suspensions of pigments in different mobile liquids affords a more complete dispersion of the solid matter and consequently more exact values for the hiding power of the pigment. The hiding power of a given suspension is the total projected area of the particles of the pigment held in suspension. In the actual determination of this factor the suspension containing the correct amount of pigment is placed in position above an incandescent electric light bulb, so as to intercept the direct rays of light from the lamp and consequently dim the image of the incandescent filament. With opaque pigment the light is shut off entirely, while in the case of transparent pigments the dimming of the direct rays of light is due to the refraction or diffusion of the direct rays of light so as to produce extinction of the direct image of the filament.

The results are expressed in the quantities of the different pigments that are required to extinguish the direct rays of light of a given surface or inversely by the surface area that a weight or volume of a given pigment can darken. This is expressed in square centimeters per cubic centimeter of the pigment. It is assumed for the sake of simplicity that the particles possess spherical form. Simple algebraic expressions have been developed for this factor and the average size of the particles. Let P be the given weight of pigment, g the specific weight of the latter, P divided by g the absolute volume of the pigment, v the average volume of a particle, d the average diameter of a particle and x the number of particles in the volume of the pigment V.

Then, from the formula of the volume of a sphere, we have

(1) $v = \frac{\pi d^3}{6}$, and as (2) $\frac{V}{v} = n$, we have by substitution in (1), the following equation:

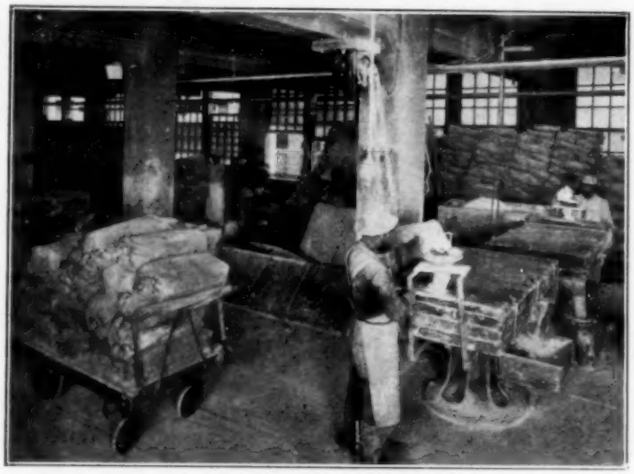
(3) $$n = \frac{V}{1/6\,\pi d^3} = \frac{6V}{\pi d^3}.$$

The projected area of a particle is equal to the area of a plane passing through the center of the sphere. Consequently it will be given by the formula: $\frac{1}{4}\pi d^2$. The total projected area of n spheres will then be $\frac{n\pi d^2}{4}$. When the value of n, as found in equation 3, is introduced into the last equation, we will have the following:

$$\frac{6V}{\pi d^3} \times \frac{\pi d^2}{4} = \frac{3V}{2} \times \frac{1}{d}.$$

The projected area or hiding power will be: $P.O. = K\frac{1}{d}$.

Consequently, the hiding power is inversely proportional to the diameter of the particles. For reasons of expediency it is desirable to carry out this determination on a given weight of pigment and to calculate the results in square centimeters



PIGMENT WAREHOUSE AND SCREENING ROOM

per gram. When this figure is multiplied by the density of the pigment, the results are converted into volumetric figures, that is in square centimeters per cubic centimeters.

The turbidimeter is made up essentially of a Nessler tube, which is provided with a lateral tube soldered on near the bottom of the former and which communicates with another tube, provided with a plunger which makes it possible to vary the level of the liquid in the Nessler tube in a manner similar to that employed in the Sargent colorimeter. The Nessler tube is mounted above a 40 watt tungsten lamp, in such a manner that the direct rays of the light necessarily pass through the bottom of the tube only. A millimeter scale is fixed to the tube in order to permit the ready determination of the height of the liquid.

Method of Procedure

The method of procedure consists in grinding the pigment with a suitable vehicle and suspending the paste obtained in a suitable medium. Castor oil and glycerine may be used as the grinding media and alcohol and a mixture of water and glycerine, 70 parts of the former to 30 parts of the latter by volume, may be used as the media of suspension. These

liquids can be employed with all the different pigments that are used in the compounding of rubber. After the suspension is made, a small quantity is placed in the tube and the level of the liquid is raised to that point at which the incandescent filament of the lamp can no longer be seen through the turbid suspension. The height of the column is then noted.

The reciprocal of the concentration of the suspension in grams per liter, divided by the height of the column in centimeters, gives the obscuring power in square centimeters per gram. Then by multiplication of this figure with the density, the obscuring power in square centimeters per cubic centimeter is obtained.

The results obtained by this method are given in the following table which covers practically all of the pigments commonly used in the compounding of rubber. In classifying the pigments according to the increasing diameter of the particles, the same series is obtained as is shown in the table according to the numerical value of the obscuring power, expressed in square centimeters per cubic centimeter. This is with the exception of carbonate of magnesia which is slightly out of line.

Pigments.	Concentration of the pigment in the suspension grams per lit	Grinding agent.	Medium of suspension	Sq. cm. per gram.	sq. cm. per cu. cm.	Density
Carbon black.	0.05	1	2	6,300	11,000	1.75
Pentasulphide of antimony.	0.25	1	2	6,300	11,000	3.35
Lampblack.	0.05	1	2	4,500	8,000	1.75
Oxide of iron.	0.50	1	2	1,430	6,400	4.50
Oxide of zinc.	0.50	1-3	2-4	1,000	5,650	5.65
Lithopone.	0.50	1-3	2-4	820	3,600	4.40
White lead (corroded).	0.50	1-3	2-4	465	3,100	4.70
White lead (sublimed).	0.50	1-3	2-4	425	2,700	6.35
Kaolin.	0.50	3	4	100	2,600	2.60
Litharge.	0.50	1	2	250	2,400	9.50
Magnesia.	0.50	1-3	2-4	540	1,900	3.50
Sulphate of barium.	0.50	3	4	350	1,500	4.30
Asbestine.	0.50	1	2	200	1,400	2.55
Aluminum.	0.50	1-3	2-4	550	1,520	2.75
Carbonate of lime.	0.50	1-3	2-4	550	1,400	2.75
Carbonate of magnesium.	0.50	1	2	440	1,100	2.05
Tripoli.	0.50	3	4	470	900	1.90
Talc.	1.00	1-3	2-4	290	760	2.60
Mica.	1.00	1	4	120	360	3.00

This method of measuring the size of the particles makes it possible to control the fineness of the pigment rapidly and exactly. The fineness of substances used in the manufacture of rubber is not only of importance, as far as these materials belong to the class of pigments, but is also of considerable significance in such materials as the mineral accelerators. The effectiveness of these substances as accelerators of the vulcanization of rubber is dependant on the fineness of their sub-division, that is on the relative dimensions of the particles. This is particularly true of such a substance as magnesia. When all other conditions remain unchanged, the accelerating power of this material will increase as the fineness of the particles increases. When magnesia possesses a good hiding power, it will generally be quite effective as an accelerator. However, the relation between the accelerating power of the vulcanization accelerator is not a straight line, as the former does not vary as the first power of the latter.

Various mixtures, containing different proportions of rubber and pigment, were made up, vulcanized and the tension-elongation curve determined in each case. The following conclusions were drawn therefrom:

1. When the quantity of pigment which is required to result in a definite elongation, 300 per cent, is carried as a function of the volume of the charge added to 100 volume of rubber, the tension curve was found to be a straight line.

2. The slope of this straight line is a measure of the stiffening action of the load.

The following table gives the slopes and the hiding power of various pigments.

Pigment.	Hiding Power in square centimeters per cubic centimeter.	Slope.
Carbon black	11,000	0.50
Oxide of iron.	6,400	0.33
Oxide of zinc.	5,600	0.24
Sulphate of barium, special.	3,000	0.15
Sulphate of barium.	1,500	0.08
Kao'in.	2,600	0.33

Referring again to the first table given above, it may be seen that the pigments which have a hiding power, which is less than 5000 square centimeters per cubic centimeter, belong without exception to the materials which are known to be inactive as far as the vulcanization is concerned. A very good conception of how a rubber mixture, containing a certain unknown pigment, will act, that is a pigment whose effect on the vulcanization process is not known, can be obtained by determining the hiding power of that pigment, and comparing that with the known values of other pigments whose action on the vulcanizing mass is known.

Conclusions

The examination of the various methods of testing pigments to determine the size of the particles is of considerable importance in permitting the operator to pre-determine the properties of the vulcanized rubber that will be produced with the pigment. The size of the particles is also of importance as far as the accelerating power of certain mineral accelerators is concerned. Consequently, it is essential to have a method which will give accurate results and which will not require too highly special a technique, so that it may be applied rapidly and accurately in the laboratory of the average rubber mill. The importance of the above exposition of the various methods that are used for this purpose is accordingly apparent, and being made by an experienced rubber chemist, the conclusions that are derived from this study are of interest to rubber men in general.

The Green method was found to be very accurate and furthermore it can be readily applied and used successfully by the average chemist. The results that are obtained are not of extreme scientific accuracy, but they are satisfactory for all technical purposes. The Vogt or the Wiegand method will give results which are sufficiently useful for practical purposes. These methods are very rapid. The Dinwiddie process, which gives very interesting results and which can be used in testing pigments used in the compounding of rubber, is recommended for the examination of pigments used in manufacturing paints.

Rubber Table Protectors

Rubber table protectors for home use, taking the place of asbestos protectors, have just been offered by the wholesale trade in New York and will shortly be on sale in retail stores. They are made up into a set consisting of a large centerpiece, six round pieces to place under plates, and six smaller pieces for use under cups and saucers. To give the protectors the appearance of china ware the rubber is chemically treated, and comes out of the process pliable, smooth, and highly decorative. No linen table cloth is required when this novel set is used—a fact which should make it popular with housewives.

Scientific Management for Rubber Mfrs.

(Continued from page 275)

rubber going to the bottom or to the rear and becoming so dry that it has to be reground.

Elevators must be provided between the store rooms. The raw material storage should have elevator connections with the compound room. Staircases and passenger elevators must not be overlooked. It will be found that electric tractors to pull the trucks from one department to another on the same floor increase the speed of delivery and are a great saving in man-power.

In laying out the factory the owners must have the maximum production expected from that plant in mind. Experience has shown time and time again that where a factory is too large it cannot be managed efficiently no matter how many methods are used. In determining the physical limits of the factory the owners must be guided by one man's ability to manage the place completely, since a very large organization becomes unwieldly. If the demand for this company's products increases to such a point that the present quarters cannot fill the need, it is advisable to build up another factory rather to continue to expand indefinitely and make the task of management harder and harder.

Paper-Making Opens New Field for Rubber Latex

AS announced through the trade papers, Frederick Kaye, Fellow of the Royal Chemical Society of England and inventor of the new process for using rubber latex in paper manufacture, hopes to visit the United States soon to confer with manufacturers and others interested, and to learn the results of experiments in this country with his process.

The paper division of the Bureau of Foreign and Domestic Commerce will be glad to hear from any manufacturers interested in conferring with Mr. Kaye, so that it may let him know whether the American interest in his process is sufficient for him to come to this country.

Commercial Attaché W. S. Tower, at London, has sent word that Mr. Kaye has recently received a consignment of latex from the Far East. Mr. Tower says that paper makers in other countries have already made requests to receive allotments of this latex up to the full amount of shipment. The Bureau of Foreign and Domestic Commerce has cabled to London, requesting that a special supply of latex be reserved for American manufacturers, a number of whom have expressed themselves as desirous of securing latex in sufficient amounts to conduct extensive tests. The Bureau of Standards will also probably conduct tests if it can obtain a sufficient supply of latex.

The merits claimed for the new process are already well known to American paper manufacturers, namely, increased strength and folding qualities of the paper, improved texture, greater ability to resist water, etc. Experiments have demonstrated that additions of latex actually can effect these improvements in the paper. It has not yet been determined whether the rubber in the paper will deteriorate too rapidly. Whether or not the process turns out to be of real commercial value, it is hoped that the United States will secure enough latex so that the different manufacturers interested can try out its possibilities in their own particular grades of paper.

Mr. Kaye has not yet decided in what way he will dispose of his manufacturing rights in the United States. He may sell the process outright, or he may arrange for its use on a royalty basis. Inasmuch as his experiments also demonstrate the possibility of using latex in other kinds of fiber products—for instance, wall boarding, paper roofing, imitation leather, insulating material, and the like—he may dispose of the rights to one concern to use it in all its varied applications, or he may dispose of it to a number of concerns, each to use it only in the making of one kind of product.

Dental Rubber

THE apparatus which is used in the manufacture of dental rubber possesses two, three, or four containers or cylinders. Dental rubber is vulcanized at a high pressure and the steam generators which supply steam to the vulcanizing apparatus must be capable of generating steam at a pressure of 600 pounds per square inch. They are always made of strong copper plate, are well supported, and last indefinitely. The apparatus must be furnished with a manometer and a thermometer. The readings of the two instruments, however, do not always correspond in the course of the operation, as the tube of the manometer is susceptible of being injured by constant usage. The best method is to use the thermometer and the manometer simutaneously, the latter serving rather as a regulating device to fix the thermometer at a given temperature. The containers or cylinders are of different types. They contain the vulcanite plate and the plaster mold.

It is claimed that dental rubber which is vulcanized between two metallic surfaces is better and more durable than that which is vulcanized between two plaster of Paris surfaces. The vulcanization between two metallic surfaces makes the dental rubber impervious to the liquids which are found or taken into the mouth, and because of the smooth surface of the metal, considerable time is saved in the adjustment, finishing and polishing of the tooth.

The dental compounds are generally colored a rose or flesh color. With the exception of rubber, which is made especially for repair work, the method of vulcanization which is generally adopted for dental compositions consists in raising the temperature progressively to 157 degrees Centigrade within a period of 30 minutes. Then the temperature is maintained at that point for a period of 75 minutes. However, there are found on the market at the present time dental rubber compositions which require much less time for complete vulcanization. In some cases the temperature need be maintained at 157 degrees Centigrade for only 30 minutes instead of 75 minutes. Such compositions are very popular.

Another point which has always given trouble in the manufacture of dental rubber is the proper admixture of coloring matter so that the dental rubber, after vulcanization, has the proper color. The proportions in which coloring matter must be added to the rubber composition to give the best results can be determined by careful painstaking experimentation only. In general hard fine para rubber is used for this purpose; it is possible to use crepe rubber and smoked sheets, but the para rubber gives the best results. In the manufacture of dental rubber cleanliness is essential. All impurities, dust, etc., must be avoided; otherwise the vulcanized product will be spotted.

Rubber Suggested to Pay U. S. War Debts

The London correspondent of the Philadelphia *Public Ledger* reports that the suggestion has been made in rubber circles that part of the interest on the British war debt to the United States might be paid in crude rubber from the plantations of the Malay States, Ceylon, and the Dutch colonies. By this unique plan of financing, it is suggested, the plantations would avoid possible bankruptcy by having their output taken over and payment guaranteed by the British government and the United States government would receive interest in cash by reselling the rubber to American manufacturers. The correspondent adds:

"Before the war, the lowest price of rubber was two shillings per pound, which would be equivalent, allowing for the fall in the purchasing power of English money, to about three shillings and six-pence. Rubber experts believe the British and Dutch governments might, by measures restricting production on all rubber plantations, raise the price to one shilling six-pence or two shillings, which would remunerate growers, while manufacturers would have a stable price considerably lower than the pre-war price.

"If the interest were scaled down as above suggested, British interest on the war debt might be valued, say, at twenty to thirty millions sterling a year. Might not this sum or a portion of it be shipped in rubber at a fixed price to the United States Government and sold to the rubber manufacturers ?"

Lower Costs -- Higher Dividends

The Bukit Cloh and Bakru Selangor rubber companies have declared dividends of 31¼ per cent for the year 1921 according to a London cable to the *Journal of Commerce*. In 1920 the Bukit paid 8 1/3 per cent, the Bakru nothing. The difference is referrable wholly to economies in operation. Production costs in 1920 averaged, respectively, 10.56d and 12½d per pound f.o.b. In 1921 they were but 6¾d and 7d, while now they are in each case below 4½d. This most remarkable revision of working costs should have an important bearing on the future price of rubber, whether under a restriction of output scheme or unfettered conditions of production.

Factice an Important Factor in Proofing

CRUDE rubber is mixed with other ingredients for two reasons. First, to reduce costs and, second, to impart to the rubber certain qualities not already possessed by it. As in other branches of the rubber industry, compounding in the proofing trade is based upon these two principles. Each of the hundred ingredients added to the rubber in compounding has its particular function of lowering cost or adding some feature to the batch. In many cases the ingredient may combine these two qualities, which, of course, means that it is just so much more valuable to the proofer.

Factice, white, brown and black, has been used in rubber proofing for the last thirty years. No material which has stood the test of time in this way can fail to be of real benefit to the proofer. What, then, are these benefits, and why is rubber factice so indispensable to the manufacturer?

Factice also possesses certain marked similarities to crude rubber, including elasticity, tackiness, and ability to absorb and hold fillers. When used in correct quantities, from 5 to 10 per cent of the weight of the batch, factice adds durability to the finished product by taking up and distributing evenly the fillers and still helping the batch retain the qualities of crude rubber.

The first qualification of properly proofed goods is the ability to shed water. In order to secure this waterproof coating with a minimum number of spreader coats it is essential that the compound be thoroughly mixed before going to the churns. The presence of foreign particles or lumps of poorly mixed stock under the spreader knife creates pinholes which can be covered up only with greatest difficulty and oftentimes with considerable additional cost. It is here that factice is of real value to the proofer because of the smooth texture and uniform quality of the substitute, it works readily into the rubber fibers without destroying any of its elasticity, and by distending the fibers allows the other fillers to be readily taken up and evenly absorbed throughout the mass. During the operation of mixing factice assists in holding the batch together and the completely mixed stock has all the qualities of crude rubber with lessened cost. Even spreading and the avoidance of disastrous pin holes are additional advantages.

In many cases lessened cost can be secured in the mixing and spreading operations due to the action of factice in holding together the rubber fibers and absorbing and distributing evenly the mineral fillers.

Provided factice contains uniform quantities of free sulphur, even vulcanization is insured through the distribution throughout the batch of the vulcanizing agents. This factor is important to the proofer, as the flexibility of the final product is second in importance only to the waterproof qualities.

Flexibility also depends in great measure upon the number and method of putting on the spreader coats. Good quality factice insures light, even coatings which completely cover the surface and give waterproof qualities with minimum weight.

Some of the higher grade factices, especially those made from rapeseed oil, possess the ability to neutralize the odor of rubber which is desirable in some branches of proofing, especially in clothing work.

In the treatment of the massed material from which various rubber articles are manufactured attention must be paid not only to the resultant product desired but also to the ease with which the material will pass through the various machines before it reaches the final form in which it is to be vulcanized.

For example, in the manufacture of white or red pure gum tubings it is not enough to merely compound crepe rubber with sufficient zinc oxide, sulphur, and accelerator to produce a desired quality at a given price. The compounder must remember that hard, high grade rubber and fillers when mixed with accelerators are liable to "scorch" on the mills and a suitable lubricant must be used to prevent this. If raw vegetable oils, petrolatum, or palm oils are used for this purpose there is a liability that they will dry out prematurely and that the stock will become lifeless. Here is where factice can be used to advantage. It serves as a mild lubricant preventing mill burning or tube machine burning and at the same time it remains stable in the cure whereas raw oils are liable to blister.

In tubing machine work a compound of rubber and fillers alone tends to emerge from the machine in a rough, knotty form. The addition of 3 to 5 per cent of factice will eliminate this difficulty.

In the manufacture of red inner tubes a considerable reduction in cost can be obtained by forming the tubes from a tubing machine instead of laminating them on a calender. The tubing machine difficulties can be eliminated by the addition of 1½ per cent of floating brown factice to the tube compound.

The field for the use of various grades of factice in both the white and the brown is wide and covers many divisions of the rubber industry. Typical lines of rubber goods in which factice is incorporated in the compounds are:

Druggists' Sundries—Hot Water Bottles; Non-Blooming Red Syringe Tubing; Red Syringe Bulbs; High Grade Surgical Drainage Tubing; Non-Blooming Soft Black Rubber Stopper; Nursing Bottle Nipples.

Automobile and Bicycle Tire Goods—High Grade Tire Frictions; Tire Cushions; Treads (White & Black).

Mechanical Rubber Goods—Garden Hose; Garden Hose Cover; Garden Hose Friction; Belting Friction; Corrugated Matting, Stair Treads, Automobile Mats, and White Perforated Mats; Heel and Sole compounds; Jar Rings.

Use of Rubber in Road Making

(By U. S. Consul Marshall M. Vance, Colombo, Ceylon.)

EXPERIMENTS are being carried out by the Colombo municipality in the use of rubber as a road-surface dressing. The dressing, which is the invention of a Ceylon rubber planter, is now being used on a portion of Darley road, which is one of the most used thoroughfares in Colombo. This solution was first tried on a road of the Deviturai rubber estate, where it has been in use for the past 13 months. A short stretch was later laid in the municipality of Galle. The present test, however, is the hardest to which the new solution has been put.

The solution is made from pure bark and scrap rubber. The method of laying is similar to that employed with tar and asphalt preparations, it being heated until liquid and then spread on the road with brooms. Fine gravel is then sprinkled over the solution and a steam roller binds the two.

The experiments so far show that this solution is easier to handle than tar. It is a secret formula and the inventor is still working toward its perfection. He hopes to evolve a solution which may not only be used as a binder, but also may be spread to a depth of 1 or 1½ inches so as to be a road surface in itself.

The idea of using rubber for roads has been almost exclusively confined in the past to rubber blocks, the cost being very high. The cost of the liquid-rubber road dressing is 50 to 75 per cent more than that of tar, but it is found that a tar dressing in Ceylon must be renewed every three or four months, while rubber dressing is expected to last from eight to nine months or longer. It is anticipated that a slight difference in the cost of material, in favor of the rubber dressing, will be found, that labor cost will be reduced 50 per cent at least, and that a better road surface will be procured.

100,000 Ton Rubber Pool?

A new plan for reviving the price of rubber has been devised according to a copyrighted dispatch to the New York *Evening Post* from London. This plan is reported to call for the formation of a pool of 100,000 tons of rubber to be placed under the administration of the Rubber Growers' Association, Rubber Trust Associates in New York and London, and the International Rubber Cultivators at The Hague.

The Spanish Rubber Industry

IN one of the most recent monographs prepared by the Rubber Division of the Department of Commerce some interesting facts are given concerning the rubber industry in Spain.

Although the industry, which was introduced by Frenchmen in the '70's is slowly developing, the demand for manufactured rubber goods is far in excess of the domestic supply. Imports of raw material include rubber, gutta percha, and rubber thread for use in remanufacture.

The sources and quantities of these imports are shown in the following official statistics:

		Principal Sources				
	Total Metric Tons	England	France	U. S.	Brazil	British Possessions in Asia
1913	657	20	140	1	2	317
1914	604	73	171	..	..	226
1915	1,001	188	379	1	15	302
1916	1,697	440	636	..	16	414
1917	1,337	192	509	40	78	324
1918	842	142	186	..	43	302
1919	3,760	573	2,419	8	112	186
1920	4,174	1,367	2,014	240	39	251
1921	3,614	692	1,357	746	7	372

In 1920 there were in Spain about a dozen firms engaged in manufacturing rubber goods (some of these firms also manufactured other lines, such as electric wire and cables, leather goods, etc.) employing over 1000 hands and with an annual production of over 12,000,000 pesetas worth of various rubber wares. With the exception of one in Madrid, all are located in the northeastern part of Spain known as Catalonia, of which Barcelona is the chief city and port.

Leading firms include: 1. Neumaticos Nacional, S.A., Barcelona; 2. Sociedad Pirelli, Barcelona; 3. Sociedad Anonima del Caucho Industrial, Madrid; 4. S. A. Empaquetaduras Morali, Barcelona and Bilbao; 5. Jansana y Ca., S en C., Klein y Ca., Barcelona.

The first of the above mentioned firms manufacture tires and rubber-soled "alpargatas." The factory is supplied throughout with American equipment. The tire output is about 1500 tires and 500 inner tubes per year. Although the materials used are first-class, the workmanship is poor, and the product inferior. The company is capitalized at 4,000,000 pesetas. The Pirelli firm is a subsidiary of the Italian company. Tires and tubes are manufactured in about the same amount as by the Nacional, and the product has a good reputation for quality. The Madrid company, with a capital of 3,000,000 pesetas, and with approximately 200 employes, produces annually, under the registered trade mark "Pareat," goods to the value of 2,500,000 pesetas. The products include belting, hose, inner tubes of all kinds, insulating materials, joints, mats, heels and soles, bicycle casings, solid tiring for carriages, etc. The Klein Co. also makes tires for automobiles, and maintains branch sales offices in some cities.

Exports of rubber manufactures from Spain are steadily increasing. The leading markets to which exports were shipped in 1913 were Argentina 33 per cent, France 33 per cent, Belgium, Netherlands, Italy, Germany and the United Kingdom, in the order of their importance. In 1921, when more goods were exported than in 1920, the order of importance of leading markets was as follows: the United Kingdom 50 per cent; Portugal, Argentina, Germany, France and Belgium.

It is reported that the French Michelin company is considering the advisability of operating a factory in Spain. The present protective tariff together with general laws for the protection of national industries (information concerning which will be supplied on request by the Department of Commerce) give manufacturers in Spain a decided advantage over importers in the matter of price. The Spanish manufacturers have a Rubber Manufacturers Association and there is also an India Rubber and Allied Trades Employers' Syndicate, and in 1920 when the constantly shifting of the scale of wages and the scarcity of raw materials made the maintenance of fixed prices very difficult in Spain, these associations agreed not to accept any further orders unless the customer agreed to take goods at prices quoted by manufacturers on the day of delivery. Ten firms were in this agreement, which is cited to show the extent of cooperation between Spanish companies.

May Exports of Rubber Goods from U. S.

THE value of manufactured rubber products exported from the United States during May, although still somewhat below the figure reached in March of this year, exceeded the April total by $412,950 according to *Commerce Reports*, official journal of the Department of Commerce. It is expected that the volume of exports will now remain fairly steady. Since April, 1921, when exports were at the lowest point, there has been a constant growth in the value of rubber exports from the United States, notwithstanding the decrease which has occurred in unit values of rubber products during this period.

Exports during May, 1921, were valued at $2,079,186, and during May, 1922, at $3,236,047—an increase of over 55 per cent. The only items in which the values in the past month were not greater than in May, 1921, were reclaimed rubber, rubber belting, and rubber hose. The exports of reclaimed rubber decreased from 206,123 pounds, valued at $25,772, in May, 1921, to 144,401 pounds, valued at $15,494, in May of this year, which may be accounted for by the low price of crude rubber. The belting exports decreased from $112,519 to $88,465 and the exports of hose from $113,667 to $110,097. As unit exports of these commodities were not compiled in 1921, it is impossible to tell whether a quantity decrease occurred, but this is unlikely, especially in the case of hose. For the 11 months ended May, 1921, and May, 1922, the respective total value of rubber exports shows a decrease of about 51.5 per cent from $57,699,777 to $27,844,816.

During the 11 months ended May, 1922, 210,943 pairs of rubber boots, valued at $530,890, were exported, as compared with 188,007 pairs, valued at $633,351, during the 11 months ended May, 1921. Rubber boots were the only class of goods registering an increase either in quantity or value during the period. Exports of rubber boots to Japan were largely responsible for this increase.

As compared with April, the May figures reveal consistent increases in quantity and value for all products except rubber-soled canvas shoes, which fell from 437,515 pairs to 232,952 pairs; shipments of battery jars and accessories, which in May amounted to only 23,949 pounds, valued at $8,753, as compared with 49,279 pounds, worth $20,763, in April; solid rubber tiring for vehicles other than automobiles; and waterproof clothing.

Solid tiring to the amount of 73,136 pounds, valued at $18,359, was exported in April, while in May 70,406 pounds were exported, worth $21,904. While waterproof-clothing exports increased in quantity from 56,745 pounds to 63,894 pounds, the value declined from $43,773 in April to $39,114 in May. There has been a steady growth in waterproof-clothing exports since January, when shipments totaled only 13,104 pounds, valued at $11,088.

Although it is not expected that the production of rubber heels will match that of 1921, which was a record heel year, it is believed that fully 100,000,000 pairs will be manufactured during 1922. It is said that one of the largest manufacturers of shoes in the country is now turning out 70,000 pairs of shoes a day with rubber heels, or nearly two thirds of its total production. Other manufacturers are also attaching rubber heels to a large fraction of the shoes they manufacture.

A British View of Chinese Rubber Planters

IN attempting to restrict the production of crude rubber in Asia, British and Dutch interests may find difficulty in obtaining the co-operation of native planters. Even if negotiations between the representatives of producing companies of both governments result in forced restriction, some difficulty will be experienced in the effort to control planters.

In the *Pall Mall Gazette* which has a wide circulation in London, a writer says that the Chinese planters, especially, must be considered a force to be reckoned with. Chinese rubber planters are both industrious and thorough in their own methods which are difficult to change. Witness the introduction of tapping in the third year which was the cause of much occidental merriment. But the laugh is now on their side.

Nobody well-informed in the science of crude rubber production will deny that early tapping is harmful to the trees. The Chinese were fully aware of this fact but they also knew from experience that the latex would drip, drip, drip. Consequently they tapped as much as possible at the time in order to enjoy the benefit of high prices. Chinese faces are usually inscrutable and their owners look sleepy but members of the race devote a great deal of time and thought to the study of their occupation.

Mystery surrounds many of the methods of Chinese rubber producers but it can not be denied that they accomplish much with a rapidity and exactness little short of amazing to our minds. No class knows the real status of the crude rubber industry better than the Chinese planters. As long as they perceive that the men at the head of the industry in the two important rubber-producing countries are not able to agree, so long will they hold themselves aloof from the negotiations to solve the problem which confronts the international rubber trade today. Although they will do nothing to help the British and Dutch planters to wriggle out of their predicament, they will not move their fingers to oppose them in a solution of the problem. However, the moment they see the chance of the slightest benefit to themselves in adopting any scheme that may be put before them, they will do so.

Many in the trade do not regard the attitude of the Chinese planters as a matter of great consequence. It is pointed out that the plantations of Indo-China do not exceed three per cent of the total area planted in the East.

How Rubber Stamps Deceived the Entente

Under the title "Unhinging the World with Rubber Stamps" the *New York Herald* of July 9 published a plausible story of how the German forger Erich Anspach, by means of clever duplication and use of imitation official rubber stamps, deceived the high officials of the Entente nations at Genoa into believing that Germany and Russia had entered into a military treaty of offense and defense. The chief of the Berlin criminal police is said to have found 600 rubber stamps in Anspach's home. The man is now in a Berlin prison awaiting trial and probable conviction.

"Give me all the rubber stamps I want and I can unhinge the world," is his boast. "War and peace in Europe, the hates and prejudices of races, the future not only of Europe but the rest of the world— all can be dictated by me if I have the rubber stamps."

With rubber stamps, clever duplicates of the originals, he drew up the documents, signed them and made them appear official. Then he sent them where they would do the most harm. He collected large sums of money from those who were willing to pay for the damaging documents and then betrayed the purchasers by giving them information that he had invented in his own weird brain.

Rubber Heels on Leather Footwear

A STUDY of preliminary official figures of the United States Census of Manufacturers of 1920, by the Rubber Division of the Department of Commerce, covering production during the year 1919, shows that 275,357,206 pairs of leather boots and shoes were manufactured by the 1,449 establishments reported. This is exclusive of slippers, and fiber and other footwear not of leather. It is estimated that 90 per cent of the boot and shoe manufacturers in this country equip at least a part of their output with rubber heels. During the same period the production of rubber heels by rubber-manufacturing companies reached a total of 138,468,769 pairs, while 9,777,085 pairs of rubber and composition-fiber soles were manufactured.

If all of the rubber heels were used as original equipment, about 50 per cent of the leather shoes manufactured in the United States in 1919 would have been put on the market with rubber heels attached. Some allowance must be made, however, for the consumption of rubber heels for repair purposes. The exportation of rubber heels from the United States also assumes considerable proportions. It is conservatively estimated that 30 per cent of the leather shoes manufactured in the United States in 1919 left the factory equipped with rubber heels.

While this seems a high percentage, it is scarcely to be doubted that a census for the year 1921 would show a much more common use of the rubber heel. One unofficial estimate places as high as 75 per cent the shoes now so equipped on leaving the factory, and even conservative estimates do not go below 50 per cent.

The durability of American rubber heels has reached a high state of perfection, and the degree of comfort experienced by wearers of rubber heels has undoubtedly had much to do with their increased popularity. Shoes for men are more often equipped with rubber heels than are women's shoes. It is estimated that 75 per cent of the rubber heels manufactured are for men's shoes.

Rubberized Clothing for Children

The rubberized checked cloths are said to be gaining great popularity with mothers who are on the watch for kiddies' clothers that are both smart-looking and slow to show the signs of soil from much rough play. Although these rubber cloths are light in weight, they are soft and pliable and are being manufactured in a variety of bright checks which look well on little tots.

Blue and white checkered cloth is being used for bloomer dresses which are trimmed with inserts of tucked white linen, introduced in the front of a tight fitting bodice and in a V neck. The waist is fitted but the skirt is bouffant which lends a quaint appearance to the little figure. The panties are also decorated with a linen band that eliminates the gripping of the tight band at the knee.

Many other novel and artistic combinations are being shown by manufacturers, it is said.

The dresses are easily cleaned. This factor alone is a big consideration when the busy mother takes her children away for a vacation. They save laundry bills, eliminate the use of petticoats, and when the dress is soiled, a damp cloth will both clean and freshen the garment.

Objections that the garments are too warm are being answered by manufacturers who point out that the rubber is of such light weight that children soon become much attached to their rubber clothing due, probably, to the fact that they do not have to be so careful of "soiling" their dresses.

Plain colors are being used in the material. It has much the same appearance as silk when seen at a distance due to the finish which is said to closely resemble a radium taffeta.

Akron University, Akron, Ohio, is said to be the only college in the United States having a complete training course in rubber chemistry.

NEWS OF THE INDUSTRY

Hodgman Rubber Company 84 Years Old

ONE of the oldest rubber manufacturing plants in the United States, the Hodgman Rubber Company, of Tuckahoe, N. Y., is now celebrating the eighty-fourth year of its existence. The founder was Daniel Hodgman, a New Englander, who first worked in a small New York City rubber factory for three years and in 1838, when only thirty years old, entered into partnership for the sale of rubber goods at retail.

Poor business and the withdrawal of his partner from the enterprise did not discourage Mr. Hodgman. He persisted and his retail business grew. He was forced to rent a larger store and to branch out into manufacturing.

Mr. Hodgman became an inventor also. A new type of life preserver, for which he received the diploma of the American Institute Fair in 1839, and an improved overshoe, of which a pair are still the prized possession of the company, are credited to him.

Outfitted the Forty-niners

During the gold rush to California in 1849 hundreds of the gold-seekers were equipped with rubber knapsacks by this pioneer manufacturer, and the Hodgman name was on every one of them. At that time the factory was at 26th street and the East River.

With the invention by Charles Goodyear of the process of vulcanization, the manufacture of durable and serviceable rubber goods was largely facilitated.

It was in 1853 that Mr. Hodgman moved his factory to Tuckahoe where a stone cotton mill gave him larger quarters and cheap water power. This mill, over 100 years old, and still standing, was the foundation of the Hodgman plant.

During the latter years of Mr. Hodgman's life he trained his two sons, George F. and Charles A., in the business.

Pioneers in Rubber Raincoats

Charles A. Hodgman became the manufacturing expert of the company, while his brother managed the financial end of the business. Under the management of George F. Hodgman the business entered a new era. In 1882 a new factory was built in Mount Vernon, and equipped to handle exclusively the manufacture of mackintoshes and raincoats. This excursion into the raincoat field on a large scale was one of the epochal events in the manufacture of rubber goods. The Hodgmans perfected a system of vulcanization that removed all traces of odor; they improved the quality so that very light and stylish raincoats and mackintoshes could be made.

Under a new policy nearly everything the company sold was of its own manufacture, and could be guaranteed as to quality.

In 1885 the company was incorporated, and in 1903 the present store at 806-808 Broadway, New York City, was first occupied.

Three years later George F. Hodgman died, and Charles A. Hodgman became president. But ill health forced him to relinquish the office after three years, and the business then came into the hands of the third generation of Hodgmans, who now control it. George B. Hodgman, son of George F. Hodgman, was elected president; his brother, S. Theodore Hodgman, was elected treasurer, and F. A. Hodgman was made vice president. The direction of the manufacturing and selling phases of the business is largely entrusted to A. W. Warren.

The company now manufactures a large line of rubber goods, which may be divided into three classes—raincoats and rubber surface clothing; druggists' sundries and specialties, including air goods, rubber bands, and molded goods; coated cloth, including hospital sheetings and fabrics of various sorts for the manufacturing trade.

Clark Rubber Receiver Asked

A receivership for the Clark Rubber Company, of Elyria, Ohio, has been requested by the United States Rubber Company on the ground that the defendant illegally and without authority turned over the assets of the company to J. P. Guild, a former officer, with instructions to dispose of them and, after paying the expenses of selling, to distribute the proceeds among the general creditors. The plaintiff alleges that some stockholders have not paid in all of their subscriptions and that the property is in danger of being lost. The plaintiff company also asks for a judgment of $1052.53 claimed to be due for merchandise sold to the Clark Company.

Firestone Traveling Exhibits

Ten "traveling exhibit courses," consisting of a manual on highway construction and transportation, samples of crude rubber, tire fabrics, sections of finished tires and tubes, and motion picture films showing the history of rubber from tree to tire, have been made up by the Firestone Tire & Rubber Company to be used at ninety important educational institutions, according to an announcement from Akron. Study of these courses will lead to the degree of highway engineer.

Harvey S. Firestone, president of the company, in a preface to the manual points out that his object is to supply constructive and educational information essential to the improvement and advancement of highway engineering and transportation the world over.

New $80,000,000 Auto Merger

THE Associated Motor Industries, a new $80,000,000 consolidation of automobile, truck, engine and auto parts manufacturers whose plants are scattered over seven states, has been formed at Dayton, Ohio, under the direction of Will I. Ohmer, of Dayton, chairman of the board of directors and former president of the Recording & Computing Machines Company of that city. There are fourteen manufacturing plants in the merger, all owned outright by the new corporation. Five assembling plants, in addition to the others given below, are located at Indianapolis, Boston, Louisville, St. Louis, and Oakland, Calif. The factories so far included in the consolidation are:

National Motor Car & Vehicle Corporation, Indianapolis; Covert Gear Company, Lockport, N. Y., transmission and clutch makers; Recording & Computing Machines Company, Dayton, Ohio, ignition, magneto, starter, battery and generator manufacturers; Jackson Motors Corporation, Jackson, Mich.; Kentucky Wagon Manufacturing Company, Louisville, Ky.; Saginaw Sheet Metal Works, Saginaw, Mich.; Traffic Motor Truck Corporation, St. Louis, Mo.; Murray-Tregurtha Corporation, Boston, Mass., manufacturers of gasoline engines, and the H. F. Holbrook Company, New York, manufacturers of automobile bodies.

The officers of the corporation, besides Mr. Ohmer, chairman of the board, include: Louis Ruthenburg, Dayton, president; A. A. Gloetzner, Lockport, N. Y.; Robert V. Board, Louisville, Ky.; T. C. Brandle, St. Louis, Mo.; and George M. Dickson, Indianapolis, vice presidents.

A force of 20,000 skilled mechanics will be employed to man the various plants. During the next twelve months a dealers' financing fund amounting to $35,000,000 will be made available, according to the company's announcement.

Singapore-Los Angeles Cargo

What is said to be the first direct shipment of crude rubber from Singapore to Los Angeles was the recent arrival in Los Angeles Harbor, on the Pacific Coast, of 1000 tons on the Dewey, of the Struthers & Barry line. This was more than one-fourth of her entire cargo, and was consigned to the local plant of the Goodyear Tire & Rubber Company. Officials of the rubber company stated that regular shipments of crude rubber from India direct to Los Angeles will be made hereafter.

Quality Rubber Gets Big Order

The Quality Rubber Company, of Ashland, Ohio, is busily at work on $50,000 worth of orders, said to be the largest recorded in the history of this concern.

Republic Rubber Going Strong

ACCORDING to the latest reports, the Republic Rubber Corporation of Youngstown, Ohio, has improved its industrial and financial condition to such an extent that the time is not far distant when the present receivership may be discharged by the court. Much of the credit for this highly satisfactory situation is due to Charles H. Booth, receiver, and the able executives of the company, Carl H. Zieme, Samuel Heintz, Raymond Kent, J. Mont Miller and Russell S. Mussellman.

Mr. Zieme joined Republic Rubber in 1911, having been chemist for the National Light & Thorium Company and the New Castle Stamping Company. In 1916 he became manager of the hose department, and is at present assistant works manager, in charge of chemical and development work.

Mr. Heintz is a graduate mechanical engineer and before coming to Republic was employed by several large manufacturing concerns.

The works manager is Mr. Kent who has been associated with the company for five years.

Mr. Miller, production superintendent in charge of the tire division, has been with Republic Rubber since 1910. For 13 years previously he was with the Stambaugh-Thompson Company.

Mr. Musselman, superintendent of production in the mechanical goods department since 1920, joined the company ten years earlier, having been chief clerk of the Erie Railroad for nine years.

Republic Rubber did a gross business in May of $556,000, an increase of 20 per cent over April, and earned $9,699 net. June business was at about the same average rate as May. The corporation is producing 1,800 tire casings daily and the plant has been enlarged and new mechanical equipment installed to take care of increased volume of orders.

The recently authorized issue of $1,500,000 certificates of indebtedness has been sold and the proceeds are being used to retire previous issues amounting to $1,000,000. At the present rate of gross sales and net earnings the company should soon be in excellent condition for the court to turn the plant and property back to the owners.

Goodrich Busy on Radio Parts

The manufacture of hard rubber parts for radio telephony is becoming increasingly important at the Goodrich plant in Akron. The company has always done more or less work on hard rubber, but with the advent of radio as an important industry this department has been flooded with orders for many of the articles needed in radio transmission and receiving equipment. The continued popularity of the radiophone will probably result in increased volume of business in this department of the Goodrich plant.

Firestone-Apsley Expansion

The Firestone-Apsley Rubber Company, of Hudson, Mass., is making changes in the factory layout by which the plant capacity will be increased nearly one-third. These changes have been ordered in anticipation of an increased demand for the company's products in the near future. Vice President L. A. Brown, in answer to an inquiry, said:

"The proposed changes will make a better routing of materials through the factory, avoid delays and effect economies in production cost. The changes include moving certain departments to other locations and the changing of the lighting system, affording general illumination rather than local lighting in order to improve working conditions for the employes. The water supply will also be improved. Steps will also be taken to install timeclocks to eliminate chances of misunderstandings between employer and employe."

The changes were decided upon at a meeting of the executive committee of the company.

Plant Closed for Inventory

The Goodyear plant at Akron closed down on Friday, June 30, at the end of the second shift and remained closed, with the exception of a few departments, until the start of the first shift the morning of July 5. The occasion was the taking of the regular semi-annual inventory of some departments. The material storerooms, departments 121 and 122, took inventory from stock cards at the close of business June 30.

Philip C. Benjamin Dead

Philip C. Benjamin, superintendent of the Boston Rubber Shoe Company, died on June 22 after an illness of several months. He was 46 years old. He started in the pattern department of the company 25 years ago and learned all departments of the business thoroughly. Promotion came rapidly, and in turn he was made assistant superintendent, factory manager, and superintendent. He was a member of the Malden, Mass., chamber of commerce. A wife, two sons, and a sister survive him.

Rubber Co. Director Convicted

C. B. Carpenter, former director of the Knox Tire & Rubber Company, of Mount Vernon, Ohio, was recently convicted of embezzlement in the common pleas court of Morrow county, that state. He was charged with embezzling 414 shares of the common stock of the company, the value of which was fixed by the jury at $10 a share. Attorneys for the defense have appealed for a new trial and will carry the case to the higher court.

Pennsylvania Rubber Expanding

Beginning early in August, the Pennsylvania Rubber Company, of Jeanette, Pa., will have increased its curing facilities to such an extent that it will be enabled to produce a minimum of 5000 tires and 7000 inner tubes daily. Extensions to equipment were made during the period of semi-annual inventory starting July 1, when the plant was closed.

Concerns in Larger Quarters

The Pickerill Rubber Company, J. M. Pickerill, president, has leased half of the first floor, and the second, third and fourth floors and basement of the Washington Avenue Building, St. Louis, Mo. The company handles a general line of raincoats and slickers. Increased business forced it to seek larger quarters.

The fifth floor of the same building has been leased to the British-American Rubber Company for manufacturing purposes.

Oak Hill Plant to Resume

The bondholders of the rubber factory at Oak Hill, Ohio, have arranged with J. E. Ford, who is interested in a rubber plant at Chillicothe, Ohio, to take over and operate the former establishment. Mr. Ford, who is a conductor on the Baltimore & Ohio Railroad, will obtain leave of absence from the road so that he can place the Oak Hill plant in operation by July 20.

McGraw Sales Increase 35 Per Cent

The McGraw Tire & Rubber Company, East Palestine, Ohio, has increased its daily output to 2,500 tires and 3,600 tubes and is operating on a 24-hour schedule. May earnings were $45,000 and sales for this month showed an increase of more than 35 per cent over those for April. June sales are estimated in excess of $500,000.

Mohawk Resumes Dividends

The directors of the Mohawk Rubber Company, Akron, Ohio, recently voted to resume cash dividend payments on July 1, at the rate of seven per cent, to stockholders of record as of June 26. A gratifying increase in sales and profits is reported by officers of the company.

H. W. Sherlock Promoted

H. W. Sherlock, formerly in the factory accounting department of the Goodyear Tire & Rubber Company, Akron, has been promoted to be manager of sales accounts. He has been with Goodyear since 1916. During the war he was in France with the chemical warfare division.

Lambert Tire & Rubber Co. Asks Protection for Patents

In an action in the United States Court in Cleveland the Lambert Tire & Rubber Co., of Akron, asks that William A. Brubaker, a former employe, and the Brubaker Tire & Rubber Co. be restrained from making a tire similar to the Lambert tire.

Brubaker in 1921, the petition recites, was directed to work out and proportion a tire. He aided in making a number of the tires in the Lambert plant. Letters of patent were granted in Brubaker's name. The petition recites that he asked $75,000 in cash, notes and additional Lambert stock to assign his patent rights. The Lambert Tire & Rubber Co. says he had previously assigned patents for nominal sums.

Lambert patents on the Lambert tire and the mold used in its manufacture would be infringed upon by the Brubaker tire, it is averred. Protection of the two patents also is asked.

G. M. Collette, general manager of the Lambert Tire & Rubber Co., recently announced the appointment of Fred A. Kemple as general superintendent of the Lambert plant. Mr. Kemple, who is 36 years old, has had an experience of 21 years in the tire industry, seven of which he spent as construction, production and general superintendent for the American Rubber & Tire Co.

Excel Plant Reopens

The Excel Rubber Company, which was raised out of receivership about a month ago, has again begun operations at its plant in Wadsworth, Ohio. The plant was shut down six months ago but stockholders maintain that the company was solvent throughout the receivership. Belts and tires are being manufactured.

To Sell Batavia Assets

The sale of assets of the Batavia Rubber Company, Batavia, N. Y. has been authorized by U. S. District Judge John R. Hazel at Buffalo, who has appointed as appraisers A. M. Prussian, of New York; William H. Thompson and Max Becker, of Buffalo. The appraisers were appointed after the filling of an equity action against the company by Louis J. Hohn on behalf of all creditors.

John Woodward, the receiver, is authorized to sell at public or private sale without an appraisal all the office furniture and fixtures in the New York office which is located in the building at 30 East 42d street. The assets in Batavia include property and buildings, finished tires, tires in the process of manufacture and raw materials.

In his application for the appointment of appraisers, Mr. Woodward maintained that the creditors' committee had secured several good offers for the property. The plant is reported to be worth about $450,000, on which there is a first mortgage of $30,000 and a second mortgage of $12,000. Total liabilities are said to exceed $702,000.

Plant of Askam Rubber Co. Sold

The plant of the Askam Rubber Co., Milford, Conn., which went into the hands of a receiver nearly two years ago, has been purchased by representatives of large rubber manufacturing interests located in New York whose names have not been stated. The deal was the result of the efforts of William R. McCarthy, president of the Rostand Manufacturing Co. and formerly receiver for the Askam company, and the Union and New Haven Trust Co., which held the mortgage on the property, buildings and machinery of the rubber company.

The new company has already taken possession of the plant and will begin operations as soon as the necessary alterations and arrangements can be made. A wide line of various rubber articles will be manufactured.

Avalon Plant Sold

A syndicate represented by Clyde Alvis has bought the plant of the Avalon Rubber Company, Barberton, Ohio. The consideration in the sale was $28,500. The deal was approved by Harry L. Snyder, referee in bankruptcy, and confirmed by Federal Judge D. C. Westenhaver of Cleveland.

Stockholders of the Avalon company, which has been in the hands of a receiver for several months, bid $30,000 for the plant; they offered to give $10,000 cash and to give notes for the balance. But since the syndicate which Mr. Alvis represents offered cash, the referee approved the sale to him. According to Mr. Alvis, the plant will be equipped for the manufacture of radiophone outfits and electrical appliances. Whether the hard rubber parts of the radio sets will be manufactured there has not been learned.

New Superintendent for Mason

H. H. Forrest, superintendent of the Sandusky, Ohio, plant of the Erie Tire & Rubber Co., Cleveland has resigned to accept a position in the same capacity in the plant of the Mason Tire & Rubber Co., Bedford, Ohio. Mr. Forrest had been superintendent of the Sandusky plant ever since it opened five years ago.

Carew & Billhardt New Brokers in Crude Rubber

M. M. Carew and Philip Billhardt announced recently that they had formed a partnership to succeed the firm of Carew & Sheehan, Inc. The new firm is known as Carew & Billhardt and has located at the same address as its predecessor, 61 Whitehall street, New York City.

Panther Rubber Co. Files Suit for $1,000,000

The Panther Rubber Co., Stoughton, Mass., has filed a suit for $1,000,000 damages in the United States district court at Boston against the Barrett Co. with offices in New Jersey and Maine. The damages sought are alleged to be a loss sustained by the rubber company due to the alleged unsatisfactory quality of an oil compound bought by it from the defendants for use in the manufacture of rubber heels.

The Panther Rubber Co. claims that it used the substance in manufacturing heels valued at $733,973.65 which were distributed among the trade in this country. A green mold gathered on the heels, the Panther company says in its brief, making them unmerchantable. It is claimed that after the contract was entered into between the two companies, the Barrett Co. of Maine transferred its property to the company of New Jersey.

Erie Tire & Rubber Co. to Sell Some of its Property

In order to pay certain claims aggregating about $55,000 against the defunct Erie Tire & Rubber Co., Sandusky, Ohio, Judge Westenhaver recently authorized H. R. Greenlee and C. A. Peckham, receivers for the company, to sell real estate of the Sandusky Land & Building Co. This real estate firm is controlled by the Erie company.

Ask Dissolution of Ashland Tire & Rubber Co.

In a petition filed recently in common pleas court the directors of the Ashland Tire & Rubber Co., Ashland, Ohio, have made application for the dissolution of the company due to the losses heretofore sustained and the present unsatisfactory manner in which it is necessary to carry on and manage the business. The directors declare that such action would be most beneficial to the interests of the corporation. A judgment dissolving the Ashland company and the appointment of a receiver to handle the sale of the property so that there may be an equitable distribution of the funds is asked.

A. C. Rubber Co. Organized to Make Heels

The A. C. Rubber Company of Elyria, Ohio, is the name of a new firm which has been incorporated at Columbus with a capital of $10,000. Those interested in the company are W. R. Huntington, J. W. Dewhurst, F. A. Stetson, M. G. Wilder, J. A. Ebert, A. T. Glew, A. F. Kwiss, R. D. Hurd and S. M. Dewhurst.

The company will market a rubber heel which is to be made at one of the Akron plants but packed and shipped from Elyria.

Firestone Wins on Appeal

The judgment of the District Court, Charleston, S. C., in favor of the Marlboro Cotton Mills, Marlboro, S. C., against the Firestone Tire & Rubber Company has been reversed to some extent by the Circuit Court of Appeals of South Carolina, the latter directing the lower court to grant a temporary injunction until a final hearing should determine whether the default judgment was secured without legal service of process or through mistake, accident, or fraud.

The case grew out of a default judgment issued against Firestone for breach of contract brought by the Marlboro Mills involving $121,492.05 damages claimed by the cotton mill company for losses due to failure of the Firestone company to fulfill contractural obligations in the purchase of cord fabric. The case was appealed by the Firestone Tire & Rubber Company of Ohio and the Firestone Tire & Rubber Company of West Virginia, acting jointly, on grounds that the process had not been legally served and it developed when the appeal was taken that the contract was not with the West Virginia company but with the Ohio company.

To Reduce Freight Rates

The traffic division of the Rubber Association of America, at its recent session in Akron, worked on a proposal to reduce freight rates on crude rubber, to be presented to the railroad classification committee at Atlantic City this month. The rate reduction on tires shipped from Akron to Pacific Coast points, from $4.33½ to $2.75 or lower, still requires the confirmation of the Interstate Commerce Commission. A. G. Phillips, traffic manager of the Fisk Rubber Company, is chairman of the division.

$1,000,000 Damage Suit

The Barrett Company, manufacturers of a product known as "B.R.V." which is used in making rubber heels, has been sued for $1,000,000 for alleged losses resulting from the use of this article by The Panther Rubber Company, of Stoughton, Mass. The latter company claims that the use of "B.R.V." as a substitute for certain oils formerly used rendered rubber heels valued at $733,973.65 unmarketable and therefore worthless.

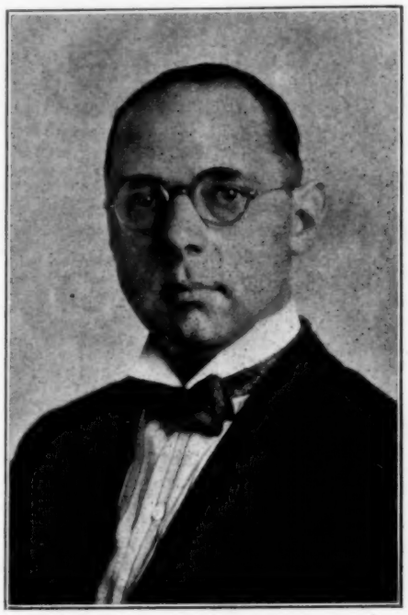
Mass. Plant to Reopen

Raw stock is being transported to the plant of the Boston Woven Hose & Rubber Company, at Chiltonville, Mass., preparatory to reopening for the manufacture of rubber floor mats and other specialties. The factory was formerly used to work over reclaimed rubber, but it is now intended to manufacture from crude rubber and fabrics.

David Leslie Brown Honored

An unusual distinction was conferred upon David Leslie Brown, manager of the advertising department of The Goodyear Tire & Rubber Export Co., Akron, O., June 14, when at the commencement exercises at Ohio Wesleyan University, Delaware, O., he received the honorary degree of master of arts.

The degree was given in recognition of Mr. Brown's achievements in trade relations and international commerce promotion.



DAVID LESLIE BROWN

For the past four years Mr. Brown has served as chairman of the export committee of the Association of National Advertisers and by special invitation he has acted as trade advisor at the 1921 and 1922 conventions of the National Foreign Trade Council.

Duty Decision on Rubber Boots

The Board of United States General Appraisers at New York has overruled the protest of the Max Kalter Mercantile Company, Inc., and assessed a duty of 30 per cent ad valorem under paragraph 256 of the 1913 tariff act. Claim was made for a 10 per cent rate under classification as "manufactures in chief value of India rubber, not specially provided for," but the decision stated that rubber constituted the component material of chief value in eight different styles and the higher rate of duty was levied.

Portland Rubber Opens Branch

A branch store in the Everett Hotel annex, where the company will specialize in beach goods and balloons, has been opened by the Portland Rubber Company, Portland, Me. Byron B. Berry is in charge.

Death of Edward R. Caldwell

The death is announced in Syracuse, N. Y., of Edward R. Caldwell, president of the Syracuse Rubber Company and one of its original organizers. The company manufactures automobile tires in a large plant on the outskirts of the city. Mr. Caldwell was the founder of the Caldwell & Ward Brass Company and for many years president of E. R. Caldwell & Son Brass Company.

Eno Speeding Production

The program of the Eno Rubber Corporation, Los Angeles, which is receiving crude rubber direct from the Orient through that port, calls for production of 600,000 inner tubes this year and an increased output of Exso tires. This tire is a complete rubber casing which is vulcanized by a patented process over used tires—a process which is said to be very successful in renewing the life of the casing.

The company recently increased its capitalization to take care of the growth of its business. W. J. Voit is vice president and sales director.

Toy Balloons by the Thousands

That boys and girls are still as fond of rubber toy balloons today as they were a generation ago is evidenced by the 14,400 daily production of the Renown Rubber Company, of Bryan, Ohio. The plant makes all sizes from the penny seller to the one retailing at ten cents each. Other rubber articles will be manufactured later on.

Goodyear Builds 6 Dirigibles

Aircraft production activities of the Goodyear Tire & Rubber Co. has been brought to capacity through a new order received from the United States Navy Department for three dirigibles with a displacement of 250,000 cubic feet each. The new ships will be constructed for helium gas inflation and will be assembled some time in July, following completion of three ships for army use.

New Chemical Warehouse

The Wishnick-Tumpeer Chemical Company, of Chicago, has opened a warehouse and office in Gund Building, Davenport avenue and East 14th street, Cleveland, where a complete stock of industrial chemicals and pigments will be carried. C. A. Hemingway, formerly with Firestone Tire & Rubber Company, is the manager.

Stokes Adds Hard Rubber Line

The Joseph Stokes Rubber Company, of Welland, Ontario, Canada, will soon add a line of hard rubber products, including radio parts, insulators, high tension insulators, telephone receivers, etc.

MARKETS

Cottons and Fabrics

NEW YORK, JULY 10, 1922

THE report of the Department of Agriculture on the condition of the cotton crop as of June 25 makes it certain that there will be no cheap cotton this year. It showed a general condition of 71.2 per cent of normal and an acreage of 34,852,000. This is an increase of 10 per cent over the area planted last year and a gain of 2 per cent in condition but this condition compares with a ten year June 25th average of 76.9.

The yield estimated on this year's crop is forecast at 11,065,000 bales which compares with a production of 7,953,641 bales last year, 13,439,603 bales in 1920, 11,420,763 bales in 1919 and 12,040,532 bales in 1918. There is an indicated yield of about 151.9 pounds per acre compared with 124.5 pounds last year.

As the reserves have been depleted by the short crop last season and the world's requirements this year are estimated to be 13,000,000 bales the immediate effect of the report was an advance of 1¾ cents a pound in the price of the raw material. Spot cotton advanced to 23.75 cents a pound, a high figure unequalled in years and compared with 12.05 cents a pound on the same day last year.

The effect on the goods market followed quickly as leading mills withdrew prices pending developments and dealings. Quotations on spot goods only were given.

After the holiday prices eased off and later in the week crop report, weevel and weather were all forgotten in the disturbing news from Germany, and the uncertainty over possible developments in Europe. The local market for spot cotton worked down to 22.75 cents per pound.

Cotton prices as of July 10 on the New York Cotton Exchange follow:

	Open.	High.	Low.	Close.	Prev. Day.
July	22.30	22.30	21.68	21.83	22.48
Oct.	22.20	22.25	21.76	21.82@21.84	22.45
Dec.	21.95	22.08	21.62	21.68@21.71	22.25
Jan.	21.67	21.77	21.37	21.37	21.97
March	21.56	21.69	21.26	21.26	21.83
May	21.43	21.43	21.03	21.03	21.59

The World Wide Cotton Survey

Commercial attaches in the ten leading cotton manufacturing centers of Europe have received instructions as to the survey that is to be made of the cotton manufacturing industries of the world. Special attention will be given to these subjects:

Raw cotton imports and exports; consumption and stocks.
Mill ownership and management.
Employment, wages and active machinery.
Types of goods manufactured, exports, imports and standard prices.
Financial aspects:—Importing raw cotton; manufacturing; exporting cotton goods; importing cotton goods.
Sales aspects; normal and actual terms and methods of selling.

It is expected that a report of the first world survey of cotton will be issued about October 1.

A Tariff of 12 Cents a Pound on Egyptians Proposed

An amendment to the tariff schedule increasing the rate on long staple cotton to 12 cents a pound was introduced by Senator Ashurst on July 7. A rate of 7 cents per pound was in the tariff bill as presented by the Senate Finance committee, the same rate that appears in the Emergency tariff. Tire manufacturers are deeply interested in the proposed duty and have taken the position that even a tariff of 7 cents is unwarranted. The Rubber Association of America will fight the Ashurst amendment and oppose the tariff of 7 cents as reported by the Senate Finance Committee.

(Since the above was written a duty of 7 cents per pound was finally fixed by the Senate as the tariff on cotton having a staple of 1⅜ inches or more.)

Shipping Rates Increased on Egyptians

The freight rate on Egyptian cotton to the United States has been increased 10 shillings a ton, according to late advices from Cairo. A common ground for agreement was finally arrived at between the shipping companies whereby cotton will be carried to the United States at 35 shillings a ton and to the United Kingdom at 25 shillings. The rate to the United States until this new agreement was 25 shillings a ton. The agreement at this figure expired on May 1 last and was continued since then pending the outcome of the discussion of a new rate.

EXTRA STAPLE COTTON

Prices on extra staple cotton, strict middling in grade and color f.o.b. New Bedford were quoted as follows: 1⅛ inch, 33 to 34 cents; 1 3/16 inches, 35 to 37 cents; 1¼ inch 38 to 40½ cents; 1 5/16 inch, 42 to 45 cents; Egyptian uppers, medium, 29½ to 31 cents; Peruvian Mitafifi, 29 to 31 cents; high grade Sak, 49 to 53 cents; Sea Island, extra choice, 46 to 49 cents.

TIRE FABRICS

There is a feeling in some quarters that prices of tire fabrics will go much higher this fall. Among the reasons advanced is the tariff proposed on long staple cottons in the Fordney bill.

The best of the business now being done is in cord fabrics. There has been a decided turning from square woven fabrics to cords and it is said that many southern mills that have been making square woven have changed a large part of their machinery to manufacture cords.

CORD FABRICS

Combed Sakellarides	lb.	.80	@	.84
Carded Sakellarides	lb.	.73	@	.75
Combed Peeler	lb.	.70	@	.75
Carded Peeler	lb.	.53	@	.58
Combed Egyptian uppers	lb.	.70	@	.73
Carded Egyptian uppers	lb.	.65	@	.68½

SQUARE WOVEN

17¼-ounce Egyptian uppers, combed	lb.	.65	@	.68
17¼-ounce Egyptian uppers, carded	lb.	.60	@	.62½
17¼-ounce Sakellarides, combed	lb.	.75	@	.79
17¼-ounce Sakellarides, carded	lb.	.68	@	.71
17¼-ounce Peeler, combed,	lb.	.65	@	.70
17¼-ounce Peeler, carded,	lb.	.48	@	.54

Sheetings—Prices have held firm the market fairly active. For 40 inch, 3.75 yard 11½ cents was asked. There was interest in 40 inch, 4.25 yard at 9¼ cents and sales of 40 inch, 3.60 yard, at 10¾.

Ducks—A quiet market prevailed. Single filling brought 18½ at 19 cents; and 19½ at 20 cents was asked for double filling, price varying according to the grade. Belting and hose continued at 39 at 42 cents.

Burlaps—Late cables from Calcutta would indicate that the new jute crop will be the smallest harvested in many years. It is estimated that the crop will not exceed 4,300,000 bales. The total area under jute is figured at only 1,425,000 acres.

SHEETINGS

40-inch 2.50-yard	yd.	.14¼	@	—
40-inch 2.85-yard	yd.	.12½	@	—
40-inch 3.15-yard	yd.	.14	@	—
40-inch 3.60-yard	yd.	.10¾	@	.11
40-inch 3.75-yard	yd.	.11	@	.11½
40-inch 4.25-yard	yd.	.09¼	@	—

DUCKS

Belting	lb.	.39	@	.42
Hose	lb.	.39	@	.42
Enameling	lb.	.41	@	.47
Shoe Ducks	lb.	.45	@	—
Single filling	lb.	.18½	@	.19½
Double filling	lb.	.19½	@	.20½

BURLAPS
(Carload Lots)

8 -ounce 40-inch	100 yds.	6.30	@	6.40
7½-ounce 40-inch		6.30	@	6.40
10 -ounce 40-inch		9.50	@	9.60
10½-ounce 40-inch		9.75	@	9.85

DRILLS

37-inch 3.25-yard	yd.	.11¾	@	—
37-inch 2.75-yard	yd.	.13¼	@	—
37-inch 3.00-yard	yd.	.12¼	@	.12½
37-inch 3.50-yard	yd.	.10⅞	@	—
37-inch 3.95-yard	yd.	.10	@	—

OSNABURGS

30-inch 7-ounce		.13½	@	.14
40-inch 7-ounce		.13½	@	—

Chemicals and Compounding Ingredients

THE INDUSTRIAL CHEMICAL MARKET, JULY 10, 1922—More active demand for industrial chemicals was noted after the holidays but it was evident by the size of orders that purchases were being made to cover immediate requirements only. In those directions where the market was inactive, the dullness was due to the usual summer quiet in consuming trades. Throughout the entire market there was a firm tone and prices were well maintained. This was due to the steady progress for betterment in lines of business not affected by seasonal inactivity. In some departments manufacturers received a fair number of orders for future delivery and, in general, delivery on contracts were of normal volume. There is a pronounced feeling of optimism as to the future.

ACCELERATORS

Organic

Aldehyde ammonia, crystals	lb.	$ .95 @	.98
Aniline oil, bulk basis,	lb.	.15 @	.18
Excellerex,	lb.	.45 @	.50
Formaldehyde-Aniline	lb.	.50 @	—
Hexamethylene-tetramine	lb.	.72 @	.75
Paraphenylenedramine	lb.	1.60 @	1.70
Thiocarbanilide	lb.	.30 @	.45
Vulcocene	lb.	.35 @	—

Inorganic

Lead, dry red bbls.	lb.	.09 @	.10
Lead, white, basic carbonate	lb.	.07¼ @	.08
Litharge, domestic	lb.	.08½ @	.08¾
imported	lb.	.17 @	—
Lime, Superfine	lb.	.02¼ @	.02½
Magnesia, calcined, light,	lb.	.24 @	.25
extra light	lb.	.45 @	—
heavy	lb.	.05½ @	.06
Orange Mineral	lb.	.12 @	.14

COLORS

Blacks

Carbon Black	lb.	.16 @	.20
Micronex	lb.	.17 @	.24
Lamp Black	lb.	.12 @	.40
Bone "	lb.	.05½ @	.07½
Drop "	lb.	.07½ @	.16
Ivory "	lb.	.15 @	.45

Blues

Prussian	lb.	.55 @	.60
Ultramarine	lb.	.08 @	.35
Cobalt	lb.	.21 @	.26

Browns

Iron oxide	lb	.04½ @	.05
Sienna, Italian,	lb.	.05½ @	.14
Umber Turkey,	lb.	.04 @	—
Vandyke, domestic		.03½ @	.04½

Greens

Chrome, light, c. p.	lb.	.30 @	.32
medium	lb.	.35 @	.36
dark	lb.	.36 @	.45
commercial	lb.	.12 @	—
Rubber Makers Green	lb.	3.50 @	—

Reds

Antimony, crimson	lb.	.40 @	—
golden	lb.	.21 @	—
red sulphuret	lb.	.20 @	.22
Indian, English, pure	lb.	.12 @	.15
Para toner	cwt.	1.25 @	1.40
Rubber makers red	lb.	3.50 @	—
purple	lb.	2.50 @	—
Toluidine tone	lb.	2.10 @	—
Tuscan red	lb.	.17½ @	.35
Venetian red	lb.	.03½ @	.06
Vermillion, quicksilver, English	lb.	.90 @	.95
domestic	lb.	.25 @	.30

Whites

Albalith	lb.	.06 @	.06½
Aluminum bronze	lb.	.55 @	.60
Azolith	lb.	.06 @	.06½
Lithopone, domestic (factory)	lb.	.06 @	.06½
Zinc oxide. American Horse Head Special	lb.	.08 @	.08½
XX red	lb.	.07½ @	.08
American Azo: ZZZ (lead free)	lb.	.07½ @	.08
ZZ (under 5 per cent leaded)	lb.	.07¼ @	.07¾
Z (8-10 per cent leaded)		.07 @	.07½
Zinc oxide, French process, White seal	lb.	.11 @	.11¼
Green seal	lb.	.09¾ @	.10¼
Red seal	lb.	.08¾ @	.09¼

Yellows

Chrome, light, c. p.	lb.	.16 @	.17
dark	lb.	.16 @	.17
medium	lb.	.16 @	.17
Ocher, French	lb.	.03 @	.04½
domestic	lb.	.02½ @	.03
Rubber Makers' Yellow,	lb.	3.50 @	—

COMPOUNDING INGREDIENTS

Aluminum flake	ton	25.00 @	29.50
hydrate	lb.	.17 @	.18
Ammonia carbonate,	lb.	.08¾ @	.09¾
Barium carbonate	ton	60.00 @	62.00
Barytes, southern off-color,	ton	.15 @	.17
Western, prime white,	ton	23.00 @	—
Basofor	lb.	.04¾ @	—
Blanc fixe, dry, f.o.b. works	lb.	.04¼ @	.04½
Chalk, precipitated, extra light	lb.	.03½ @	.04¼
heavy	lb.	.02½ @	.03¼
Clay, China, domestic,	ton	15.00 @	16.50
imported	ton	16.00 @	22.00
Dixie	ton	22.00 @	32.00
Blue Ridge	ton	22.00 @	32.00
Fuller's Earth, powdered	ton	23.00 @	25.00
Fossil flour	ton	60.00 @	—
Glues, extra white	lb.	.30 @	.40
medium white	lb.	.20 @	.26
cabinet	lb.	.18 @	.30
cabinet low grade	lb.	.15 @	.18
common bone	lb.	.08½ @	.14
Graphite flake, bbls.	lb.	.06½ @	.12
powdered	lb.	.04 @	.10
Infusorial earth, powdered	ton	60.00 @	—
bolted	ton	65.00 @	—
Mica, powdered	lb.	.15 @	—
Rotton Stone (powdered)	lb.	.02½ @	.04½
Silica (aluminum)	ton	22.00 @	23.00
Soapstone, powdered	ton	12.00 @	—
Starch, powdered corn	cwt.	2.85 @	2.95
Talc, domestic	ton	15.00 @	18.00
French	ton	22.50 @	30.00
French, high grade	ton	40.00 @	45.00
Italian,	ton	44.00 @	55.00
Terra Alba, American No. 1	cwt.	1.85 @	2.00
American No. 2	cwt.	1.25 @	—
Tripoli, whites	ton	27.50 @	—
Whiting, commercial	cwt.	1.10 @	—
Quaker	ton	13.00 @	15.00
English cliffstone	cwt.	1.70 @	1.90
gilder's bolted	cwt.	1.15 @	1.25
Pariswhite American	cwt.	1.25 @	1.35
Wood pulp XXX	ton	30.00 @	—
" " X	ton	25.00 @	—
Zinc Oxide— 5 per cent leaded		.07¼ @	.07¾
10 per cent lead sulphate	lb.	.07 @	.07½
20 per cent lead sulphate	lb.	.07 @	.07½
35 per cent lead sulphate	lb.	.07 @	.07½

(Also see whites)

MINERAL RUBBER

Gilsonite	ton	70.00 @	—
Genasco (factory)	ton	50.00 @	—
Hard hydrocarbon	ton	32.00 @	45.00
Soft hydrocarbon	ton	30.00 @	35.00
Pioneer M.R.	ton	42.00 @	44.00
320 M. P. hydrocarbon (c. l. factory)	ton	45.00 @	50.00
300/310 M. P. hydrocarbon (c. l. factory)	ton	40.00 @	45.00
Synpro, granulated, M.R. (factory)	ton	54.50 @	70.00

SOFTENERS

Acids

Acetic, 28 per cent	cwt.	2.25 @	2.50
Phenol	lb.	.12 @	.18
Cresylic, 97 p. c.	lb.	.56 @	.58
95 p. c.	lb.	.51 @	.53
Muriatic, 20 degress	cwt.	1.10 @	1.25
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulphuric, 66 degrees	ton	16.00 @	17.00
60 degrees, bulk	ton	10.00 @	12.00
Tartaric, crystals	lb.	.30 @	—

Alkalies

Caustic soda, 76 p.c.	cwt.	3.75 @	3.90
Soda ash, 58 p.c.	cwt.	2.15 @	2.20

Oils

Castor, No. 3, bbls.	lb.	.11 @	—
Corn, crude, bbls.	lb.	10.55 @	—
refined	lb.	.12½ @	—
Chinawood, bbls.	lb.	.13 @	.13½
Cottonseed,	lb.	.12 @	—
Glycerine, drums	lb.	.15 @	.16
Linseed, domestic	gal.	.87 @	.88
imported	gal.	.82 @	.84
Palm, Niger		.06½ @	.06⅝
Lagos	lb.	.07⅛ @	.07⅜
Peanut, domestic, crude	lb.	.12 @	.12¼
Pine, steam distilled	gal.	.85 @	.90
Rapeseed, refined	gal.	.84 @	.85
blown	gal.	.95 @	1.00
Rosin, first rectified	gal.	.39 @	—
second rectified	gal.	.41 @	—
Tar, commercial	gal.	.31½ @	—
Soya Bean		.12 @	—
Petrolatum, standard	lb.	.05 @	.08

Resins and Pitches

Cumar resin, hard	lb.	.09 @	.12
Cumar resin, soft	lb.	.09 @	.12
Tar Retort	bbl.	9.00 @	—
kiln burned	bbl.	9.00 @	—
Pitch, Burgundy	lb.	.05 @	.06
coal tar	ton	.01½ @	—
pine tar		.03½ @	—
Rosin, grade K	bbl.	6.50 @	—
Strained	bbl.	6.00 @	—
Shellac, fine organe	lb.	.85 @	—

Solvents

Acetone, drums	lb.	.08½ @	.10
Alcohol, denatured, No. 1 bbls.	gal.	.32 @	.34
Methyl, 95 per cent, drums	gal.	.52 @	—
Benzol, 90 per cent	gal.	.27 @	.32
pure	gal.	.30 @	.35
Carbon bisulphide,	lb.	.06 @	.07
tetrachloride	lb.	.09½ @	.10½
Dimethylaniline	lb.	.35 @	—
Motor gasoline, steel bbls.	gal.	.24 @	—
Toluol, pure	gal.	.30 @	.35
Turpentine, spirits	gal.	1.20 @	—
wood	gal.	1.15 @	—
Xylol, pure	gal.	.45 @	.51
commercial	gal.	.34 @	.39

Waxes

Beeswax	lb.	.36 @	.38
sun bleached	lb.	.45 @	—
Caranuba, No. 1	lb.	.16 @	.17
Ceresin, white	lb.	.09 @	.10
Bayberry	lb.	.20 @	.24
Montan, crude	lb.	.04 @	.05
Ozokerite, black,	lb.	.18 @	—
Paraffine 133-135M.P.	lb.	.06 @	—
Petrolatum, amber, bbls.	lb.	.04 @	.04¼
dark amber	lb.	.03½ @	.04

SUBSTITUTES

Black	lb.	.09 @	.14
White	lb.	.09 @	.16
Brown	lb.	.10 @	.15
Brown factice	lb.	.08 @	.14½
White factice	lb.	.09 @	.16

VULCANIZING INGREDIENTS

Lead, black hyposulphite (black hypo)	lb.	.25 @	.35
Sulphur chloride (jugs)	lb.	.20 @	—
Sulphur flour pure	cwt.	2.60 @	3.10
Bergenport pure	cwt.	2.55 @	3.15
superfline, 100 p.c.	cwt.	2.12 @	2.60

Caustic Soda—The market continues exceedingly active with the 76 per cent material quoted at $3.75 to $3.90 per 100 pounds. Reports for June and early July show that the demand had expanded greatly during that period.

Soda Ash—Demand has improved considerably and the output has been well taken up by domestic requirements. Car lots of 58 per cent material brought $1.75 to $2.10 per 100 pounds.

Zinc Oxide—There was a good demand from the tire and rubber industries. Quotations remained unchanged although there has been an advance in the price of zinc metal. Quotations for domestic were as follows: French process red seal 8¾ @ 9¼ cents; green seal 9¾ @ 10¼ cents; white seal, 11 @ 11¼ cents. American process, lead free, 7½ @ 8½ cents; leaded grades, 5 per cent, 7½ @ 7¾ cents and 10, 20 and 35 per cent, 7 @ 7½ cents.

Orange Mineral — The market for orange mineral was inactive with prices unchanged. Domestic brought 12 at 14 cents; German 14 cents and French, 15 cents.

Lithopone—Stocks at the factories are small and the demand for this material continues just as strong as during the last period. Foreign material is coming in in large quantities but has not interfered with domestic business. For domestic, 6¼ cents per pound, in barrels, carlots was asked and 6½ cents for less than carlots. The imported article brought 6 cents a pound.

Litharge—There has been some improvement in the demand but prices continue the same, 100 pound kegs, less than 500 pounds bringing 12½ cents; 500 to 2000 pounds, 11¼ cents; 2000 to 10,000 pounds, 10.80 cents; casks 8½ at 8¾ cents.

Blanc Fixe—The demand was fully up to the season and there are no large stocks in producers' hands. The buoyancy of the lithopone market has had a favorable effect on the market for blanc fixe. Quotations follow: dry, 4¼ at 4½ cents per pound; pulp, $40 at $50 per ton.

Barytes—The demand continued good and there was no change in prices. Prime Western brought $23 a ton, f.o.b. point of production.

Benzol—The market for this material was decidedly strong and producers had an effort to keep up with the demand. It was almost impossible to do anything on prompt shipments. Makers quoted from 30 to 35 cents per gallon on pure and producers contract price for 90 per cent was from 27 to 32 cents.

Carbon Black—The demand is away in advance of the supply and the prevailing high prices will probably continue until October. Grades used by the rubber industry continue to bring 16 to 20 cents a pound. Spot supplies are much restricted.

Whiting—The demand continues good and prices hold steady. No important changes were noted in prices. Quotations follow: Commercial, $1.10 per 100 pounds; gilders bolted, $1.15 at $1.25; American paris white, $1.35 at $1.45; English cliffstone, $1.70 at $1.90.

Talc—There was little change in this market. The demand is up to the season and prices hold firm. Domestic brought $15 at $18 per ton; French, $22.50 at $30; high grade French, $40 at $50 and Italian $44 at $55.

Carbon Bisulphide—In short supply with demand holding well and prices firm at 6 at 7 cents per pound.

Carbon Tetrahchloride—The market was unsteady and supplies in first hands very liberal. Material was offered from 9½ to 10½ cents per pound.

Linseed Oil—Owing to the strength in the seed market linseed oil advanced to 87 cents a gallon for prompt supplies. Foreign oil was steady at 82 cents per gallon.

Crude Rubber

NEW YORK, JULY 11, 1922.

THERE has been little change in the local market situation since our last report, with the exception of Paras all grades of which but Madeira and Cameta advanced about one cent a pound on the average on the strength of cable advices from Brazil. These were to the effect that some good buying had been done there for shipment to Europe at better prices than could be obtained from the American trade in competition with cheap plantation rubbers. No general buying movement developed here, but the demand for Para rubbers was undoubtedly stimulated. The latest quotations, however, are said to be well under the cost of production.

All of the plantation grades are off slightly from our previous quotations, showing the absence of any real demand. Although the London market was reported firmer, the news apparently had no effect on the sagging tendency here. The Amsterdam market is stronger presumably in the hope that the Dutch government will act favorably following the conference of government officials with the committee recently selected by plantation owners to devise ways and means of restricting crude rubber production or taxing it in some form. The rubber trade in Holland is optimistic and looks for relief in governmental circles. No news came from London as to developments which might lead to restriction. Prices for Pontianacs and Balatas remained firm.

Quotations of this date are practically as follows.

Plantations			
Ribbed Smoked Sheets and First Latex, spot	.14⅞	@	.15
August/September	.15	@	.15⅛
October/December	.15½	@	.15¾
January/March	.15⅞	@	.16
Smoked sheets, plain, spot	.14⅞	@	.15
Amber Crepe No. 1	.14½	@	.14¾
" " " 2	.14¼	@	.14½
" " " 3	.14	@	.14¼
Light clean thin brown crepe	.14¼	@	.14¾
Commercially clean thin brown crepe	.13¾	@	.14
Roll Brown crepe, spot	.12½	@	.12¾
Paras			
Madeira Fine	.22	@	—
Acre Fine	.18½	@	.18¾
Up-river Fine	.18	@	.18½
Up-river Medium	.17	@	.17½
Up-river Caucho ball (shipment)	.12½	@	.13
Up-river Coarse	.12½	@	.13
Islands Fine	.16½	@	.17
Islands Medium	.15¾	@	—
Islands Coarse	.08	@	.08½
Cameta	.08	@	.09
Xingu Ball	.10	@	.10½
Tapajos fine	.17	@	.17½
Pontianac			
Prime Pressed	.12	@	—
Plantation	.06½	@	.06¾
Bangermassin	.07¾	@	.08
Palembang	.08½	@	.09
Siak Gutta Percha	.15	@	.15½
Prime Macassar	2.75	@	2.80
Balata			
Panama Block	.40	@	—
Surinam Sheets	.68	@	.70
Columbia Block	.42	@	.45
Venezuela Block	.48	@	.50

Reclaimed Rubber

NEW YORK, JULY 11, 1922

The reclaimed rubber market is virtually at a standstill and no changes of any moment have been recorded since our report of June 30. The demand is slight, because of the low prices prevailing in the crude rubber market, and few plants are working and those only on part time. No improvement in the near future is looked for.

Quotations of this date are nominally as follows:

Standard Reclaims			
Floating	.12	@	$.13
Friction	.12	@	.13
Boots and Shoes	.09¾	@	.10½
Boots and Shoes (washed)	.13	@	.14
Mechanical	.08	@	.10
Hose	.10½	@	.11⅛
Tires, truck	.09	@	.10
Tires, auto	.09	@	.10
White	.13	@	.14

Scrap Rubber

NEW YORK, JULY 11, 1922

Some items in the scrap rubber market have advanced slightly during the past fortnight. Boots and shoes are up about half a cent, to .02¾, and arctics, both trimmed and untrimmed, have gained similarly. Inner tubes are also up ⅜ to ½ cent. Other items are about the same as at last report or have gained small fractions. The market seems to have a better tone and a firmer tendency.

Quotations of this date (per pound in carload lots delivered) are as follows:

Auto tire peelings	.00¾	@	.01
Standard White auto	.00⅞	@	.01
Mixed auto	.00⅝	@	.00½
Bicycle tires	.00½	@	—
Clean solid truck tires	.00⅝	@	.00⅞
Boots and shoes	.02¾	@	—
Arctics, trimmed	.01¾	@	.02
Arctics, untrimmed	.01¼	@	.01½
Inner tubes, No. 1	.03½	@	—
Inner tubes, compounded	.02½	@	.02¾
Battery jars, black compounded	.01	@	—
Inner tubes, red	.03	@	—
Heels and pads	Nominal		
Black mixed	.00¼	@	.00⅜
Garden hose	.00½	@	—
Air brake hose	.00½	@	.00¾
Red packing	.01	@	.01¼
Red mixed rubber	.01¼	@	.01½
White mixed rubber	.01½	@	.01¾

American Rubber Patents

1,418,220 John White, Sunningdale, England. Golf Ball.

1,418,166 Benjamin Dawson Porritt, Edinburgh, Scotland, assignor to The North British Rubber Co., Ltd., Edinburgh, Scotland. Vulcanization of Rubber and Other Substances.

1,417,970 Sidney M. Caldwell, New York, assignor to The Naugatuck Chemical Co., a corporation of Connecticut. Vulcanization of Rubber Employing amines and open-chain aldehydes and similar substances and products obtained.

1,417,509 John R. Gammeter, Akron, Ohio, assignor to The B. F. Goodrich Co., New York. Vulcanizing Mold for Tire Casings.

1,417,701 Elno H. Trump, Sebring, Ohio, assignor of one-half to John M. Aldefer, Akron, Ohio. Apparatus For Making Pneumatic Tires.

1,417,627 Edward D. Putt, Akron, Ohio, assignor to The Firestone Tire and Rubber Co., Akron, Ohio. Machine for Trimming Tires.

1,417,739 Ernest Hopkinson, New York, New York. Method and Apparatus for Manufacturing Tires.

1,417,551 Thomas Midgley, Hampden, Mass., assignor to The Fisk Rubber Co., Chicopee Falls, Mass. Vulcanizing Equipment.

1,419,422-3 Frank K. Bessler, Akron, Ohio. Inner Tube.

1,419,752 Wilbur H. Perrine, Trenton, N. J. Inner-Tube-Stripping.

1,419,907 John V. Worthington, Axminster, England, assignor to The Dunlop Rubber Co. Ltd., Regent's Park, London, England, a British Company. Manufacture of Pneumatic Tire Casings.

1,419,577 Melvon A. Marquette, Chicopee Falls, Mass., assignor to The Fisk Rubber Company, Chicopee Falls, Mass. Tire Mold.

1,419,470 Isaac A. Reasoner and Daniel J. Flintjer, Winona, Mo. Pneumatic Tire.

1,419,343 Albert Witzel, Ludwingsburg, Germany. Rubber Tire.

1,419,768 William H. Schroeder, East Orange, N. J. Sectional Pneumatic Tire.

1,419,879 Melvon A. Marquette, Chicopee Falls, Mass., assignor to The Fisk Rubber Company, Chicopee Falls, Mass. Method of Making Tires.

Trade Marks Applied For

[The following are trade-mark applications pertinent to our field pending in the United States Patent Office which have been passed for publication and are in line for early registration unless opposition is filed promptly. For further information address National Trade-Marks Company, Barrister Building, Washington, D. C. or Bush Building, 130 West 42 Street, New York, trade-mark specialists. As an additional service feature to its readers this Journal gladly offers to them an advance search free of charge on any mark they may contemplate adopting or registering.]

YELLOW JACKET TIRE PATCH, with picture of yellow jacket bees within rectangular panel. No. 151,917. Justa Manufacturing Company, Oklahoma, Okla. For rubber patches for tires and all rubber articles.

GOODYEAR ALL WEATHER TREAD ON THE HIGHWAYS OF THE WORLD, on rim of diamond with impression of tire in center. No. 152,843. The Goodyear Tire & Rubber Company, Akron, O. For vehicle tires composed of rubber and rubber and fabric.

TRANSPORT—No. 139,147. Corona Cord Tire Company, East Butler, Pa. For automobile tire casings and tire tubes composed of rubber.

DIAMOND—No. 137,472. The B. F. Goodrich Company, N. Y. For adhesive tire-repair materials—viz. vulcanized pure-gum sheet cementless patch having stocky rubber surfacing, laminated rubber patch, and rubberized patching fabric.

GOODRICH—No. 137,461. The B. F. Goodrich Company, N. Y. C. For liquid Wood-rim cement, vulcanizing cement, rubber cement, repair gum, and repair outfits.

KLINGER—No. 130,493. Racine Rubber Company, Racine, Wis. For rubber or rubber and fabric tires and tubes for vehicles.

WHITE OWL TUBE PATCH—No. 151,337. William Wallace Stiles, Gretna, La. For sheet-rubber patches known as White Owl.

HUNT FOR TIRES—No. 131,214. Vehicle Tires, Pneumatic and Solid, of rubber, rubber and fabric, leather, rubber and leather, rubber, fabric, and leather; inner tubes of rubber, rubber and fabric; blow-out boots and patches of rubber, fabric, leather, or a combination of these materials; inner tube patches of rubber, fabric, leather, or a combination of these materials; tire covers of rubber, fabric, leather, or a combination of these materials; tire reliners of rubber, fabric, leather, or a combination of these materials.

New Incorporations

ALABAMA

M. & H. Tire Co., to deal in tires and tubes. $2,000. Incorporators: M. L. Hussey, E. Morrison, T. Morrison and J. F. Schneffe. Principal office, 309 Bibb street, Montgomery, Alabama.

CALIFORNIA

Armstrong Fox Tire Agency to deal in tires $10,000. Principal office, Los Angeles, California. Representative, C. R. Burns.

DELAWARE

Rochester Rubber and Textile Co., Wilmington, to manufacture tires. $1,500,000. (Colonial Charter Co.)

O'Bannon Airless Tire Corp., to deal in tires. $250,000. Incorporators: J. V. Pacher, A. J. Pratting and E. H. Klinglefus—New York. Atlantic & Pacific Tire Stores Association, to manufacture tires, tubes, rubber heels etc. $15,000. Incorporators: B. W. Culver, A. K. Burton and W. C. Maupin. Delaware agent, United States Corporation Co., 19-21 Dover Green, Dover, Delaware.

Racine Horseshoe Tire Corp., to manufacture rubber products. $4,600,000. Incorporators: G. V. Reilly, S. B. Howard and H. C. Hand—65 Cedar street, New York City. Delaware agent, United States Corporation Company, Dover, Delaware.

Atlasta Tire & Rubber Co., to manufacture tires, tubes etc. $250,000. Incorporators: M. E. Mettler and P. M. Gilkey—Wilmington, Delaware. Delaware agent, F. L. Mettler, 832 Market street, Wilmington, Delaware.

Conservative Tire & Service Co., to deal in tubes and tires. $10,000. Incorporators: T. Mackeirman, O. S. Hammon and T. J. Melvin—Bradford, Pennsylvania. Delaware agent, Corporation Service Co., Equitable Building, Wilmington, Delaware.

Burkoe Tire & Rubber Co., to deal in tires and rubber goods. $350,000. Principal office, Dover, Delaware.

FLORIDA

Morgen-Sorgen Co., to manufacture and deal in tires. $30,000. R. C. Morgen, president; J. W. Sorgen, Sr., vice president; J. W. Sorgen, Jr., secretary. Principal office, Jacksonville, Florida.

ILLINOIS

The Sexton Super Tire & Rubber Company, to manufacture tires. $1,000. Incorporators: S. H. Silverman, 5056 Sheridan Road, C. S. Peterson and C. D. Unger—Chicago, Ills.

INDIANA

State Tire & Rubber Co., to deal in tires and accessories. $75,000. Directors: Philip Deutscher, Sam Zeukerman and Jack Deutscher. Principal office, Indianapolis, Indiana.

MASSACHUSETTS

Merchants Tire Co., to deal in tires and tubes. $50,000. A. Liebson, president; M. Katz, treasurer—378 Columbus avenue, Boston, Massachusetts. Principal office, Boston, Massachusetts.

The Rubwood Company, Inc., to manufacture rubber products. $800,000. F. M. Andrew, president, 51 Pleasant Street; T. E. Andrew, treasurer, 27 Quincy Street—Methuen, Massachusetts; H. N. Atwood, 45 Elmore Street, Boston, Massachusetts; F. K. Broadhurst, Smithfield, North Carolina. Principal Office, Lawrence, Massachusetts.

Textile Rubber Co., to manufacture rubber goods. $50,000. Incorporators: John E. Shannon, East Boston, Massachusetts; George Strangman and Charles V. McManus,, Lynn, Massachusetts.

Cravath and Parker, to deal in automobile tires and accessories. $20,000. Incorporators: A. Cravath and A. Parker— 321 Belmont avenue; C. S. Ballard, 374 Main street—street, Kalamazoo, Michigan.

MICHIGAN

Kalamazoo Tire & Rubber Co., to manufacture cord tires. $10,000. Incorporators: E. A. Campbell, M. B. Coppock and L. W. Coppock. Principal office, 410 East Randsom street, Kalamazoo, Michigan.

MISSOURI

Eagle Tire Patch Co. $25,000. G. T. McCall, president; H. E. Zahl, vice president; L. K. Rosser, secretary. Principal office, Moberly, Missouri.

NEW JERSEY

Burnett Rubber Co., Orange. $50,000. Harry H. Picking, Charles O. Geyer, Gordon Grand, Orange, New Jersey.

NEW YORK

General Rubber Products Corp., to manufacture rubber goods. $150,000. Incorporator: I. R. Davies, Yonkers, New York. Principal office, Yonkers, New York.

Spencer-Hess & Walters, to deal in crude rubber. $10,000. Incorporators: A. P. Spencer-Hess, C. Walters, E. Pfoff. Attorney, W. A. Simeon, Wall street, New York City.

Aero Rubber Products Corp., to deal in manufactured rubber products. $150,000. Incorporators: I. R. Davies, I. P and I. Todd—Yonkers, New York. Attorney, B. E. Reardon, Yonkers. Principal office, Kingston, New York.

American Company of Liberia, Ltd., to import rubber products. $500. Incorporators: V. V. Reilly, S. B. Howard, and S. C. Wood—65 Cedar street, New York City.

TEXAS

Mexia Battery & Tire Co., to deal in tires and batteries—$100,000. J. W. Prickett, President; M. A. Prickett, Secretary, and A. E. Prickett, Treasurer. Principal office, Mexia, Texas.

Grote, Hugo Tire Co., to deal in tires. $12,000. Incorporators: H. Grote, R. H. Feckner and E. Schmuck. Principal office 223 Avenue C, San Antonio, Texas.

VIRGINIA

Richmond Rubber Co., to manufacture rubber products. $50,000. Incorporators: E. R. Patterson, H. R. Conner and W. F. Merchant. Principal office, 32 North Seventh street, Richmond, Virginia.

WEST VIRGINIA

Red Giant Tire & Tube Co., to distribute tires and tubes. $50,000. E. H. Witten, president; S. T. Bird, secretary; R. N. Vermillion, treasurer. Principal office, Princeton, West Virginia.

WASHINGTON

Sunset Rubber Co., to manufacture rubber goods. $150,000. Incorporators: C. E. Fowley and W. A. Cloud. Principal office, Seattle, Washington.

Sutherland Co., to deal in tires, tubes etc. $65,000. Incorporators: J. T. Gregory, M. A. Langhorne, R. W. Sutherland, C. O. Sutherland and C. O. Sutherland. Principal office, Tacoma, Washington.

Crescent Rubber Mfg. & Supply Co., to manufacture and deal in rubber goods. Incorporators: T. Maginnis, D. P. McKellop and W. Rutherford. $100,000. Principal office, Seattle, Washington.

Leavens & Howard, Inc., to deal in tires. $1500. Incorporators: S. Leavens, G. F. Howard and A. S. Brown. Principal office, Vancouver, Washington.

WISCONSIN

Wright Rubber Products Co., to manufacture rubber tiling. $100,000. C. Wright, president; F. A. Tecktonius, vice president; L. J. D. Healey, treasurer. Principal office, Racine, Wisconsin.

Capital Increases

The Lion Tire & Rubber Corporation of Lafayette, Indiana, from $500,000 to $700,000.

THE RUBBER AGE BUYERS GUIDE

ACCELERATORS
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.
Rubber Service Laboratories Co., The, Akron, O.
States Metals Co., Inc., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ACCUMULATORS
Adamson Machine Co Akron, O.
Akron Rubber Mold & Machine Co., Akron, O.
Allen Machine Co., Erie, Pa.
Birmingham Iron Foundry, Derby, Conn.
Wellman - Seaver - Morgan Co., Cleveland, Ohio.

ACIDS
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
National Aniline & Chemical Co., Inc., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ACID TANKS
Birmingham Iron Foundry, Derby, Conn.
Devine, J. P., Co., Buffalo, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.

AIR & STEAM METAL BAGS
Allsteel Ridewell Tire & Rubber Co., Dayton, Ohio.

AIR BRAKE HOSE
United States Rubber Co., New York.

AIR GOODS
Davol Rubber Co., Providence, R. I.
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AIR MATTRESSES
Davol Rubber Co., Providence, R. I.
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AIRPLANE AND BALLOON CLOTHS
United States Rubber Co., New York.
Hodgman Rubber Co., Tuckahoe, N. Y.

ALBA WHITING
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Industrial Chemical Co., New York.
Wishnick-Tumpeer Chemical Co., Chicago.

ALCOHOL
Daigger, A., & Co., Chicago, Ill.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ALUMINUM FILLER
Daigger, A., & Co., Chicago, Ill.
Wishnick-Tumpeer Chemical Co., Chicago.

ALUMINUM FLAKE
Aluminum Flake Co., Akron, Ohio.
Butcher, L. H., Co., New York.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Rubber Service Laboratories Co., The, Akron, O.

AMMONIA AQUA
Daigger, A., & Co., Chicago, Ill.
Laidlow, Kelly & Co., New York.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ANGLE THERMOMETERS
Taylor Instrument Companies, Rochester, N. Y.

ANILINE OIL
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Klipstein, A., & Co., New York.
National Aniline & Chemical Co., Inc., New York.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ANILINE OIL PLANTS
Devine, J. P., Co., Buffalo, N. Y.

ANTIMONY, SULPHURETS
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
States Metals Co., Inc., New York.
Raro Metal Products Co., Belleville, N. J.
Tyler Patterson Co., Clev'd, O.
Typke & King, Mitcham, England.
Wishnick-Tumpeer Chemical Co., Chicago.

APRONS—RUBBER
Hodgman Rubber Co., Tuckahoe, N. Y.
Miller Rubber Co., Akron, Ohio.

ARTIFICIAL RUBBER
Carter Bell Mfg. Co., New York.
Stamford Rubber Supply Co., Stamford, Conn.

ASBESTINE
Butcher, L. H., Co., New York.
Daigger, A., & Co., Chicago, Ill.
Fulper, Edward B., Trenton, N. J.
Harshaw, Fuller & Goodwin Co., Cleveland, O.
Tyler Patterson Co., Clev'd, O.
Wishnick-Tumpeer Chemical Co., Chicago.

ATOMIZERS
The Rubber Products Co., Barberton, Ohio.

AUTOCLAVES
Devine, J. P., Co., Buffalo, N. Y.

AUTOMOBILE COATS
Hodgman Rubber Co., Tuckahoe, N. Y.
United States Rubber Co., New York.

AUTO TOP FABRICS
Hodgman Rubber Co., Tuckahoe, N. Y.
Taylor, Armitage & Eagles, Inc., New York.
Turner Co., J. Spencer, New York.
United States Rubber Co., New York.

BALATA
Wood, Charles E., New York.

BALATA FILM (Colorless)
Peters Bros. Rubber Co., N. Y.

BALLOON FABRICS
United States Rubber Co., New York.

H&G

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Cleveland
Chicago Philadelphia New York

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